COMMERCIAL FISHERIES Review

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COVER: Dogfish sharks. (Photo: R. Brigham)

COMMERCIAL FISHERIES
Review

A comprehensive view of United States and foreign fishing industries--including catch, processing, marketing, research, and legislation--prepared by the Bureau of Commercial Fisheries.

FISHERMEN'S MEMORIAL--GLOUCESTER, MASS.

The Bureau of Commercial Fisheries and The Bureau of Sport Fisheries and Wildlife make up The Fish and Wildlife Service of The United States Department of the Interior.

Throughout this book, the initials BCF stand for the Bureau of Commercial Fisheries.

Address correspondence and requests to: Commercial Fisheries Review, 1801 North Moore Street, Room 200, Arlington, Va. 22209. Telephone: Area Code 703 - 557-4246.

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Lobster catch in North Atlantic aboard BCF's 'Delaware.' (Photo: R. C. Wilson)

U.S. GROUNDFISH INDUSTRY HURT BY IMPORTS

"It is evident that the United States groundfish fishermen are suffering economically from a cost-price squeeze precipitated by the depressing effect of large quantities of imports on groundfish prices," Secretary of the Interior Walter J. Hickel wrote to President Nixon on May 21. The Secretary introduced the report of a study by BCF economists. The study had been asked by major parts of the industry concerned over the effects of imports and of changes in U.S. tariff structure for groundfish products.

"During recent years," Mr. Hickel added, "both total and per capita consumption of groundfish increased continuously; imports of groundfish doubled; while the quantity of fish landed by United States vessels and the number of fishermen employed declined."

The report--"The Effects of Imports on the United States Groundfish Industry"--covers cod, cusk, haddock, hake, ocean perch, and pollock. Flounder was added to meet many requests. Groundfish live on or near the ocean bottom. On the Pacific Coast, they are called bottomfish.

Fillets and blocks are the principal forms in which species are imported. Fillets are the sides of fish cut lengthwise, separating flesh side from skeleton. They are marketed fresh, frozen packaged, breaded and frozen--or frozen into blocks for more processing.

Blocks are fillets and other parts frozen into blocks. Each block weighs 10 or more pounds. Frozen blocks are used to prepare fish sticks, portions, and other processed products.

REPORT HIGHLIGHTS

- In 1967, U.S. landings of groundfish were 427.4 million pounds--a 25% drop from 1954. Overall, landings have "trended downward" at annual average rate of 4.5 million pounds, although Pacific coast landings have been "fairly constant."

- In 1967, U.S. processors produced 121.5 million pounds of fillets and steaks, 4% below 1956-58 annual average. (Steaks are $\frac{5}{8}$- to 1-inch-thick cross-section slices from large dressed fish. They are sold fresh and frozen packaged.)

- From 1956 to 1967, consumption of groundfish rose 48%--from 315.8 to 468.8 million pounds.

- During 1954-67, groundfish imports increased sharply. Imports were 107% higher in 1967 than in 1954-56: in frozen fish blocks and slabs for processing industry. In 1956, U.S. imported less than half the groundfish it used--but now imports more than two-thirds.

- In 1966, vessels catching groundfish employed 3,778 fishermen--down 347 from 1957.

- Rapidly increasing imports in 1953-67 resulted in a current price about 1.6 cents per pound lower than would be true if imports had the same relative relation to total consumption that they had in 1947-52.

- From 1956-58 to 1967, costs of catching and processing rose 35-40%. Exvessel price of fish increased 24% or less during 1953-55 to 1967. Catch rates did not improve, so domestic industry has been caught in a cost-price squeeze.

• U.S. Tariff Commission investigations in 1954 and 1956 found serious economic injury from imports to groundfish industry. The BCF study, which covers 1956-1967, found further deterioration "due in a large part to rising imports."

Groundfish imports in blocks and slabs have boosted total imports. They are cutting into basic markets for U.S.-caught groundfish. Per-capita consumption of fillets and steaks has fallen because sticks and portions have been substituted. Industry's fishing segment has not grown with stick-and-portion processing business. A principal reason appears to be industry's inability to compete with foreign block and slab products. Foreign costs of catching fish are lower: 1) lower vessel-construction costs; 2) subsidies to fishermen.

People in the industry are concerned about its future, particularly the future impact of concessions made in the Kennedy Round tariff negotiations. Lower customs duties on frozen blocks and slabs are expected to "intensify the present adverse cost-price squeeze."

The 1956 Tariff Commission study had found serious economic injury, so the duty on fresh and frozen groundfish fillets was exempt from the Kennedy Round. But recent technological developments cutting costs have made it easier for Canada to export to U.S. fresh groundfish fillets and steaks. Limited data reveal that Canadian exports to the U.S. in 1967 of these products were 14.1 million pounds; in 1961, the figure was only about 5.6 million pounds. This influx of fresh products appears one of the immediate and major concerns of industry; it threatens the domestic industry with loss of a large part of that market.

Industry consists of fishermen operating principally otter trawl vessels; fish processors; a marketing system serving U.S. and world markets; and suppliers to fishing vessels.

Fishing Areas

The principal grounds are over the Continental Shelf of Northwest Atlantic and North Pacific Coast. Over $\frac{3}{4}$ of U.S. catch is landed on east coast, mainly New England ports. Landings in the west are concentrated in Oregon and Washington.

The NW Atlantic area, which extends from Long Island, N.Y., to Newfoundland, covers about 260,000 square miles. It includes the very productive areas of Georges Bank, Browns Bank, Nova Scotia Banks, and Grand Bank. Most of U.S. catch is from Georges Bank, which is fished intensively also by foreign vessels. Large- and medium-sized U.S. vessels fish these areas about 50 or more miles out. Smaller U.S. vessels normally fish close to Massachusetts and Maine. In 1967, about 312.1 million pounds of groundfish were landed at New England ports, half of all fish landed there.

Pacific groundfish are caught from Santa Barbara, Calif., to northern British Columbia. California forbids extention of groundfish operations south of Santa Barbara. In 1967, U.S. vessels caught about 69.5 million pounds--6% of all west coast landings.

GROUNDFISH PRODUCTS

Groundfish are marketed from whole or eviscerated fresh (unfrozen) fish to highly processed convenience food forms: breaded-precooked fish sticks or fish portions. More processed products have been emphasized

increasingly in recent years. Fish sticks and portions now comprise over 60% of total U.S. processing of packaged groundfish products; in 1958, the figure was less than 40%. But the marketing of fresh groundfish fillets also has increased significantly. So frozen fillets now comprise only 17% of all packaged groundfish--compared to about 40% in 1958.

From the dollar standpoint, significant increases have taken place in the relative marketings of fresh flounder and haddock fillets--with a corresponding decline in frozen Atlantic ocean perch fillets.

GROUNDFISH CONSUMPTION

Groundfish consumption has been increasing steadily in the past 15 years. In 1967, it was about 48% higher than in 1956. Increasing population and per-capita use produced it. The relative importance of different products has changed: the greatest increase was in groundfish blocks, the raw material for the rapidly growing fish-stick-and-portion industry. As use of groundfish blocks increased substantially, consumption of cod and haddock fillets declined. Only flounder fillets increased steadily. Per-capita consumption of ocean perch trended downward slightly.

GROUNDFISH LANDINGS

During 1954-67, U.S. groundfish landings averaged 517 million pounds annually. However, landings declined an average annual rate of 4.5 million pounds: around 5 million on Atlantic coast; on Pacific coast, landings fluctuated widely but trended upward slightly.

Overall decline in groundfish landings resulted primarily from the great drop in quantity of Atlantic ocean perch and declines in pollock and haddock. Only Atlantic coast flounder and Pacific coast ocean perch landings increased.

Resource abundance was not a factor. The major decline was in production of ocean perch--due to less fishing effort, which resulted from cost-price squeeze on fishing vessels. On the other side of the ledger, increased abundance of yellowtail flounder resulted in increased landings in 1962 and 1963.

In Northeast Pacific, foreign fleets have increased greatly in the past 10 years, yet a much larger harvest could have been taken by U.S. from demersal species. Trawlers are capable of increasing the harvests of bottomfish, but cost-price relationships have kept U.S. fleet from expanding its catches.

Domestic Fillet, Steak, & Block Production

Most U.S. landed fish is processed and sold as fresh or frozen fillets. Domestic block production, though increasing, is still only about 6 million pounds a year. Fresh (nonfrozen) fillet production is trending upward; frozen-fillet production is declining correspondingly.

Flounder-fillet production is increasingly important: over $\frac{1}{3}$ of U.S. production of groundfish fillets, steaks, and blocks.

GROUNDFISH IMPORTS

Groundfish are imported primarily as fresh and frozen fillets and steaks--and frozen blocks and slabs. In 1967, imports of these groundfish were 316.9 million pounds, double the 1956-58 annual average. The figure was 68% of U.S. consumption of groundfish in 1967.

Blocks

Beginning in 1960, imports of groundfish blocks and slabs exceeded fillets and steaks. In 1967, frozen block and slab imports were 189.5 million pounds, almost 4 times the 1956-58 annual average. However, since 1965, block-and-slab imports have declined slightly. These imports have fed the developing fish-stick-and-portion industry that began in the early 1950s. In 1967, the U.S. produced only 6.2 million pounds of blocks and slabs--about 3% of imports.

Fillets and Steaks

In 1967, imports of groundfish fillets and steaks were 127.4 million pounds, a rise of 18% from the 1956-58 annual average. Continued growth in imports of fresh fillets "will likely make major inroads" into markets for U.S.-produced fresh groundfish products, one of principal outlets for U.S. fleet.

Imports in Relation to Consumption

As imports grow and landings by U.S. groundfish fleet decline, imports have become the larger part of U.S. groundfish consumption. In 1965, 1966, and 1967, imports reached nearly 70% of groundfish consumption. In 1956-58, imports were less than half of groundfish use.

Imports by Species

In 1967, imports of ocean-perch fillets and steaks of 36.3 million pounds were the largest of any other species. Cod fillet and steak imports were 32.1 millicn pounds. The remaining species totaled 59 million pounds. In fillet-and-steak category, only imports of ocean perch and flounder have been rising in recent years. In 1967, 33.3 million pounds of flounder fillets were imported--235% of 1956-58 annual average.

Exporters to U.S.

The principal exporters of groundfish blocks and fillets to U.S. are Canada, Iceland, Norway, Denmark, W. Germany, and Greenland. Canada and Iceland provide about 90% of U.S. groundfish imports as fillets and steaks.

GROUNDFISH PRICES

The BCF report states: "The impact of imports on domestic prices ranges from actually depressing prices in short-run periods to offsetting some of the effect of increasing demand on price in longer-run periods. This tends to limit the rate of price increase in the long run."

On Atlantic and Pacific coasts, from 1953-1967, prices received by fishermen at dockside (exvessel prices) trended upward. But a comparison of harvesting costs during this period shows these rises have been less than increases in costs. Costs in 1967 were 35-40% above 1956-58; prices increased only 24% between 1953-55 and 1967. Production costs of groundfish species that make up 97% of the landings increased more than exvessel prices; only pollock prices increased more than costs.

Wages

During 1958-67, wages of fish processing-plant workers increased steadily. Rising labor costs in the processing industry and

the retarding effect of imports on wholesale and retail prices have slowed the rate of increase in exvessel prices. This has produced a cost-price squeeze at the harvesting level.

In 1966, the costs of catching fish by Canadian trawlers were 60% below U.S. costs. Lower labor and vessel-construction costs were principal reasons. Despite transportation costs, Canadian products had "substantial price advantage" in U.S.

Effects of Imports on U.S. Prices

Imports have an "overall dampening effect" on domestic prices. One analysis showed that the "current price for groundfish is about 1.6 cents a pound lower" than if imports were same proportion of total consumption that they had been in 1953-67. Downward pressure on prices and the resultant decreased income for the sale of groundfish by vessel owners "contributed to making many vessels unprofitable to operate."

The report explains how imports are increasing cost squeeze: "Thus, the domestic fisherman is in a squeeze between increasing costs and imports in that as domestic prices rise, imports are likely to rise significantly and thus exert downward pressure on domestic prices. This is the likely explanation for the small percent increase in price in relation to increasing costs over the past decade."

Wholesale Prices, Frozen Blocks & Slabs

In 1967, imports of frozen blocks and slabs of groundfish were about 60% of groundfish imports. Prices averaged 22.9 cents per pound. In 1956, average annual price was 18.8 cents per pound. The average price for 1965-67 was 26% over 1956-58.

Fillet & Steak Prices

In 1965-67, the average price of U.S.-produced fillets and steaks was 44% above the 1956-58 average price. Prices of imported groundfish fillets were about 38% above 1956-58 average price.

JOBS

Atlantic Coast

In the Atlantic groundfish fleet, the number of fishermen dropped 12%: from 3,316 in 1957 to 2,912 in 1966. "This was a consistent year-after-year decline with the exception of 1966."

In the Boston fleet, one of the major groundfish fleets, the average hourly wage rate is below U.S. average for workers in nonsupervisory jobs in mining, contract construction, and manufacturing. Full-time

deckhands, on the average, had to work 3 hours for every 2 hours by other industry workers.

Most full-time fishermen--over 2,520 hours per year--"earned well over $6,000 from commercial fishing," near the U.S. median of $6,283 for all "year-round" full-time male workers. Most of those fishermen who worked between 1,560 and 2,520 hours earned less than $4,000. However, the report makes clear, "it is important to note that fishermen are required to work an average of 60 hours per week in order to achieve a standard level of income. Those who worked the national average earned an income which was almost half the national standard."

In 1964, 83% of U.S. labor force was under 55 years; only 38% of Boston's fishermen was under 55.

Pacific Coast

During 1957-66, despite annual fluctuations, there were no important changes in the number of fishermen in the Pacific coast trawler fleet. However, for 5 straight years before 1966, the number had trended generally downward. In 1966, there was a sharp increase.

WHO OWNS THE WATER AREAS OFFSHORE AND HOW FAR?

Ownership of offshore waters is one of the major problems to be resolved before the sea can be exploited peacefully. No country owns the floor of the open ocean. In the past, the traditional limit was 3 nautical miles, the effective distance a cannonball could be fired in the days of sailing vessels.

Now nations choose a distance between 3 and 12 miles from their shores. Within these limits they may exercise control of shipping; there is, however, no clear requirement for other nations to recognize this sovereignty. The United States recently changed its territorial water claim from 3 to 12 miles.

Although waters were originally designated territorial for defense purposes, nations are now also concerned with protecting their fishing and mineral rights. The continental shelves are important for future harvest of marine life and minerals. The Geneva Convention of 1958 provides for a nation the sovereignty over its continental shelf to a depth of 200 meters or to the depth of exploitation of natural resources. Several Latin American countries have made claims of exclusive fishing rights to a distance of 200 miles from their coasts. ('Questions About The Oceans," U.S. Naval Oceanographic Office.)

UNITED STATES

Secretary Hickel Aids New England Haddock Fishery

Secretary of the Interior Walter J. Hickel determined on June 19 that a commercial fishery failure due to a resource disaster had occurred in the New England haddock fishery. The fishery has declined significantly since 1965. Secretary Hickel cited the Commercial Fisheries Research and Development Act of 1964, which authorizes funds to assist a commercial fishery struck by a resource failure.

Research by BCF, which administers the Act, showed that haddock spawning has been very poor since 1965. Heavy exploitation, in large part Soviet, contributed to the decline.

From 1935-1963, average annual landings were 50,000 metric tons; for 1969, predicted landings are less than 10,000 metric tons.

Governors of several New England States, Congressmen, and the fishing industry, expressing concern over the haddock industry, have urged Federal assistance.

Many Fishermen Hit

Secretary Hickel stated that more than 90 New England fishing vessels, primarily from Boston, Gloucester, and New Bedford, Mass., normally depend on haddock for over 50% of their catches. They now face a severe loss of income. Also, nearly 400 other vessels that make incidental catches of haddock face losses.

One remedial measure proposed by BCF is to divert fishing effort to pollock, an underutilized species. BCF's 'Delaware II' and cooperating industry vessels already are testing the effectiveness of gear adapted especially for catching pollock.

BCF marketing specialists are working with industry to increase consumer acceptance of pollock as a replacement for haddock.

BCF Estimates Sustained Yield & Use of Pacific Hake

The maximum annual sustained yield of Pacific hake from southern Oregon to Cape Spencer, Alaska, is 300-540 million pounds. This is the rough estimate of BCF scientists.

In 1966, Soviet hake catches were 300 million pounds; in 1967, 350 million.

U.S. Hake Fishery

There is no U.S. fishery on this offshore stock. U.S. fishermen, however, have been engaged in a small fishery in Puget Sound. They have landed an annual average of 8 million pounds.

During 1964-1967, these were the total Pacific hake catches and the Puget Sound catches:

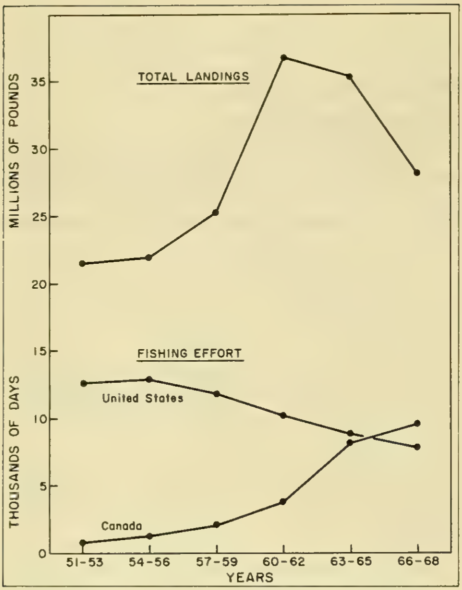
	Total Pacific Hake	Puget Sound
	. . . . (Pounds)	. . . .
1964	878,000	715,800
1965	3,146,000	1,527,900
1966	11,833,000	8,032,200
1967	28,818,000	9,564,900

Hake Potentially Useful

Pacific hake are potentially useful as human and animal food. So BCF believes it important to continue studying and monitoring the resource to evaluate the effects of these levels of exploitation.

U.S. Atlantic Coast Sea Scallop Fishery Declines Further

The decline of the United States fishery for sea scallops and the rise of the Canadian fishery continue, reports J. A. Posgay, BCF Biological Laboratory, Woods Hole, Mass. The U.S. share of this fishery was only 45% in 1966-68, compared to 94% in 1951-53. In 1951-53, total annual landings were 21.5 million pounds of meats. These rose to 36.7 million pounds in 1960-62, and dropped to 28 million pounds in 1966-68.



Average annual landings and fishing effort in the Atlantic coast sea scallop fishery by three year time intervals.

Trend in Atlantic Coast Sea Scallop Fishery					
Years	Fishing Effort (Thousands of Days/Year)				Average Annual Landings
	U.S.	Canada	Total	%U.S.	Millions of Lbs.
51-53	12.6	0.8	13.4	94	21.5
54-56	12.9	1.3	14.2	91	21.9
57-59	11.8	2.0	13.8	85	25.3
60-62	10.1	3.7	13.8	73	36.7
63-65	8.8	8.1	16.9	52	35.4
66-68	7.8	9.5	17.3	45	28.0

There also has been an interesting diversion of the fishing effort. In the earlier years, Georges Bank (ICNAF Subarea 5) supplied most of the landings; but, since 1965, the U.S. fleet has abandoned Georges Bank to the Canadians and concentrated on the Middle Atlantic grounds (ICNAF, Statistical Subarea 6).

Incidental Catch Lowered for Yellowfin Tuna

BCF has announced that tuna bait boats in the regulated area of the eastern Pacific Ocean are restricted to an incidental catch rate of 15% for yellowfin tuna taken with other tuna--and with bonita, billfishes, and sharks. Bait boats are tuna boats that use hooks and lines.

Regulations published in the Federal Register, May 3, 1969, permitted bait boats fishing regulated area during closed season to land yellowfin tuna up to 50% of vessel capacity, or 130 tons per vessel, whichever was less, until a total of 1,500 tons was reached.

Also, the regulations provided that when limit was reached, the incidental catch of yellowfin would revert to 15% maximum.

An announcement that the 1,500-ton limit was reached appeared in the June 11 Federal Register. The limitation became effective on June 13.

Purse Seining for Winter Industrial Fishery Deemed Impractical

Purse seining is not economically feasible for the menhaden industry to catch a winter supply of industrial fish in the mid-Atlantic coastal area. This is a preliminary finding of a study by the Virginia Institute of Marine Science (VIMS) under a grant from the Bureau of Commercial Fisheries. The purse seine is used to catch dense schools of menhaden during spring, summer, and fall.

Dr. Jackson Davis, head of VIMS' Ichthyology Department and of the study, said menhaden have been in short supply lately along mid-Atlantic shores. They are not available at all during winter and spring when they are thought to be in deeper waters. If other fish could be harvested for manufacture into industrial fishery products during this offseason, the industry could operate year-round. The possibility of using sea herring as an alternate was evaluated. Sea herring, cousin to the river herring caught by the millions in Chesapeake Bay each year, offers great potential.

Cape Hatteras-Block Island Study

Cruises were made in the area from Cape Hatteras, N. C., to Block Island, Rhode Island, from February through May in search of sea herring and mackerel. Most explorations were along the inner two-thirds of the continental shelf, but deeper water up to 4,800 feet also was checked. Davis reported modern electronic fish-finding equipment located schools of fish averaging less than 50 yards wide. These were mostly along the 30-fathom contour, where foreign vessels also were fishing.

Schooling During 2 Periods

Sea herring and mackerel were plentiful but were too scattered most of the time to make harvesting practical with a purse seine. The seine is effective when fish concentrate in dense schools. But fish did school briefly during 2 periods of the day: just before dawn and again just before dusk.

During first period, schools broke up into very small groups with dawn's first light. These groups settled to the bottom and remained there until late afternoon. During second period, fish schooled up in later afternoon but stayed deep until sunset. Then they rose quickly to the surface and scattered.

Schooling lasted no more than 4 of each 24 hours. In March, these fish were south of the Virginia Capes; by May, they had moved to just south of Long Island. This migration pattern is typical of fishes that winter in the mid-Atlantic. Harsh winter weather hampered experimental fishing. Only 40% of the scheduled work days were calm enough for purse boats to operate.

Shrimp-Separator Trawl Tests Continue

The M/V 'Baron,' chartered by BCF's Seattle (Wash.) Exploratory Base, recently completed fishing efficiency studies of 6 different designs of experimental shrimp-separator trawls.

Conclusions drawn from the field testing included: (1) The optimum mesh sizes for use in the capture of pink shrimp appear to be 1 to $1\frac{1}{8}$-inch in the outer portions of the body and $1\frac{7}{8}$ to 2 inches in the separator panels. (2) All separator trawls require weighting with chain to facilitate fishing near bottom. (3) Optimum-sized catches of shrimp appear to be related to the height of footrope over the bottom. (4) The 10- to 12-foot trash chutes resulted in best performance. (5) The separator trawls harvest nearly pure shrimp of much better quality than those taken in conventional trawls simultaneously with much greater quantities of fish and debris.

Future Testing

Future field work will capitalize on these findings and center on 2 of the separator trawl designs tested that showed more promise than the others. The objective of future testing will be to increase shrimp catch rates of the separator trawl to equal, or exceed, those of conventional shrimp trawls used in Pacific Northwest waters.

Certain Sounds Attract Sharks

Some of the sounds that attract sharks have been determined by researchers at the University of Miami's Institute of Marine Sciences. They also discovered that the lemon shark can perceive the displacement of water due to the passage of sound waves. This shark may use the information and pressure signals to locate prey.

Irregularly pulsed signals, 800 Hz and below, accounted for over 370 shark sightings. The tests were conducted by A. A. Myrberg Jr., J. D. Richard, and Arnold Banner. They used the Institute's underwater video-acoustic installation off North Bimini.

The Operation

Most sharks appeared at the test site in 11 to 54 seconds from onset of the signal. The signal was a low-frequency sound simulating one made by a struggling fish. On a screen inside a dry laboratory, the researchers observed various species approaching the underwater sound projector and television: the sharpnose, reef, nurse, and a silky or dusky shark. As sharks increased, their swimming activity resembled a feeding frenzy. No sharks appeared at test site when either pure tones, or signals with components only

Underwater Television. (Ed Fisher)

above 100 Hz, were generated by the sound projector.

Shark's Receptors

Dr. Myrberg said: "Because these sharks detected the signals, apparently oriented quickly to them and rapidly reached the test site, the importance of certain acoustic stimuli to these animals is assured. Our work has also revealed that the lemon shark can perceive displacement of water due to the passage of sound waves. All sharks have a great many displacement receptors arranged along their lateral line or scattered about their bodies. . . ."

Underwater TV

A unique underwater television enables the researchers to observe sharks on a screen in the Institute's small monitoring station at North Bimini. (Diving in a test area may influence animal behavior.) The TV is mounted on the sea floor at 60 feet about a mile off the coast. It can scan the underwater scene 360 degrees horizontally and 70 degrees vertically. It has a zoom lens for closeup to wide-angle viewing. Periodically, the TV's dome is automatically cleaned by a "windshield wiper" impregnated with a toxic material.

"The underwater installation also includes hydrophones, acoustic projectors, and an environmental sensor system that records temperature, current, and turbidity information. All of the instruments can be monitored and controlled by researchers in the laboratory."

National Water Commission to Consult With Governors

The National Water Commission (NWC) will hold a series of conferences Aug. 26-Nov. 7--6 regional and 1 national--on its tentative program of studies, Charles F. Luce, Chairman, announced on June 27.

The Commission is inviting the 50 Governors and representatives of municipal and intergovernmental water agencies and private organizations.

NWC is a nonpartisan group of 7 private citizens appointed by the President. It has a 5-year statutory assignment to develop an overall national water policy.

NWC's Job

The law establishing NWC directs it to review present and future U.S. water problems, assess future water needs, and identify several ways of meeting these needs. Also, it requires Commission to consider both economic and social consequences of water resource development. These include impact on regional economic growth, institutional arrangements, and on esthetic values.

Luce emphasized that the Commission's approach will recognize that it is impossible to consider water-resource development as an independent problem. This problem must be viewed as an integral part of a great U.S. effort to protect and improve the quality of man's environment.

Regional Conference

Luce said the main purpose of the regional conferences will be to get the views of state, local agencies, and organizations on the scope of NWC's tentative program of studies. The 2-day Washington conference will include national nongovernmental organizations

concerned with water-resource care and development. More than 50 nationwide associations, clubs, societies, etc., will be offered a chance to submit statements or to appear.

The conferences will be open to press and public. Participants will be encouraged to file written statements and to avoid long talks.

Luce wrote to the governors that the act establishing NWC "requires the Commission to consult with the Federal Water Resources Council (FWRC) and to furnish its reports to that body for review and comment prior to their submittal to the President and the Congress."

He added: FWRC was "primarily an organization for coordinating the work of the agencies that actually plan and carry on the Nation's water activities impartially, without being involved in day-to-day operations, and to recommend improvements in policy, procedures, and institutional arrangements."

BCF Lists Wrecks on Georges Bank & Nantucket Shoals

BCF's Fishing Vessel Safety Unit has listed the location of 36 fishing-vessel wrecks known to lie on or near productive fishing grounds off Georges Bank, Nantucket Shoals, and South Channel. Latitude, longitude, and depth in the immediate vicinity are included. The list will be distributed to the fishing industry of New England and fishermen using these areas for otter-trawl fishing.

With few exceptions, the vessels were sunk during the past decade. Reports of hang-ups and loss of fishing gear resulting from encounters with the wrecks have been reported by many fishermen.

Copies are available to the fishing industry from BCF, 408 Atlantic Ave., Boston, Mass. 02210.

Conferences Scheduled

The 22nd annual meeting of the Gulf and Caribbean Fisheries Institute, sponsored by the University of Miami's Institute of Marine Sciences, will be held at the Carillon Hotel, Miami Beach, Fla., Nov. 16-20, 1969. For more information, write to Executive Secretary, Gulf and Caribbean Fisheries Institute, 10 Rickenbacker Causeway, Miami, Fla. 33149.

The 14th annual meeting of the International Game Fish Research Conference, sponsored by the International Oceanographic Foundation, will be held at the same hotel, Nov. 21-22, 1969. Write: International Oceanographic Foundation, 10 Rickenbacker Causeway, Miami, Fla. 33149.

U.S. Fishery Products to be Promoted at Overseas Trade Shows

BCF has invited producers and processors of fishery products to participate in two overseas food trade fairs this fall. Bureau personnel will coordinate all efforts to introduce and promote U.S. fishery products at the shows. Fishery products must be U.S.-caught, or processed in the U.S. to be eligible. Floor space, adequate storage space, and interpreter services will be provided free. Participating firms are not required to send representatives.

H. E. Crowther, Bureau director, said that the purpose of the overseas trade shows is to develop and expand foreign markets for U.S. fishery and agricultural products. The Bureau has participated in 20 previous trade fairs, which have attracted leading tradespeople in Europe.

The shows are scheduled for Sept. 3-8 in Brussels, Belgium, and Oct. 4-10 in Cologne, Germany.

Participation agreements will be accepted on a first-come, first-serve basis. Deadline for receipt of the agreements is August 1. Further information may be obtained from Office of International Trade Promotion, Bureau of Commercial Fisheries, 1801 N. Moore Street, Rm. 401, Arlington, Va. 22209. Telephone: area code 703, 557-4731.

Certified Shellfish

J. David Clem

People who eat oysters are usually more familiar with the injunction to avoid this favorite seafood in the "non-R" months than they are with the unique public health problems associated with these molluscan shellfish. These problems of food sanitation and safety involve edible molluscan shellfish, especially fresh and frozen oysters, clams, and mussels, and arise because of the peculiar life cycle and environment of these marine animals.

For 44 years, the shellfish problem has been accorded official recognition in the creation and continuance of a voluntary three-way (State, Federal, and industry) consumer protection activity known as the National Shellfish Sanitation Program. Last July, the Program was transferred to the Food and Drug Administration as part of FDA's new Bureau of Compliance.

Why public health officials are concerned over these shellfish involves many facets, including reproduction and growth habits, methods of harvesting and processing, and other problems that have troubled the shellfish industry since the turn of the century.

Oysters, clams, and mussels must breed and live in estuarine waters. The estuary, defined simply, is a coastal zone where sea water and fresh water mix. These mollusks feed by pumping estuarine water through their gills, filtering into their digestive systems such substances as algae, detritus, bacteria, and whatever other suitable sized particulate and dissolved matter might be present. An oyster, through movement of its cilia, can transport water through its crude but highly coordinated anatomy at the rate of 20 liters an hour. This feeding action, however, concentrates substances with little selectivity. Therefore, the chemical and microbiological quality of a mollusk's visceral mass is a reflection of the quality of the estuarine water it inhabits. If the water is polluted, so is the mollusk. It is because of the ecology of these marine species and their method of feeding, along with the continuing degradation and pollution of our estuarine waters and our habit of eating shellfish in a raw or partially cooked state, that special health controls have had to be imposed and enforced.

Oyster production in the United States reached a peak in 1910, before the present sanitary control program began. Its decline since that time has been caused by an excess of indiscriminate harvesting and exploitation of this natural resource, uncontrolled pollution of many shellfish waters, shellfish diseases, a meagerness of technological advances in production, and an increasing lack of consumer confidence in the sanitary quality of shellfish. Human consumption of sewage-polluted shellfish has caused numerous outbreaks of infectious disease. Because there were no sanitary controls, the consumer could never be sure that the oysters, clams, or mussels he was purchasing were safe to eat. Consumer concern was voiced in an editorial in the 'Journal of the American Medical Association' in 1905: "Consumers of raw oysters at present are quite at the mercy of oyster dealers, presumably of varying intelligence and conscientiousness. There should be some means of preventing the distribution of sewage-saturated oysters in any part of the country. Is this something that the Public Health and Marine-Hospital Service should take up?"

Despite the AMA editorial suggestion, it took 20 years and an unprecedented outbreak of disease to prompt action in shellfish sanitation. Late in 1924, major typhoid fever outbreaks occurred, resulting in 1,500 cases with approximately 150 deaths, all traced to the consumption of contaminated oysters. The country was shaken by what later became known as the "oyster scare." Sales dropped dramatically. In 1925, the Surgeon General of the Public Health Service called a conference of representatives from the shellfish industry, the Department of Agriculture's Bureau of Chemistry (now FDA), the Commerce Department's Bureau of Fisheries, State conservation agencies, and State and local health agencies. This conference marked the beginning of an unparalleled cooperative agreement in the form of measures

The author joined the Food and Drug Administration in 1968 as Chief of the Shellfish Sanitation Branch in Bureau of Compliance.
Article reprinted from FDA PAPERS May 1969.

The Chesapeake Bay between Maryland and Virginia and the bay's tributaries are plentiful in both oysters and clams. Oysters are harvested with both hand tongs and power dredges, and oystermen use both sailboats and power boats under State regulations covering each operation. On Maryland's Nanticoke River (2 and 3), workers tong up oysters and cull or discard those under legal marketable size. The bay and rivers are patrolled by Maryland Marine Police for illegal oystering in uncertified waters and for other violations such as those involving times and methods of harvesting. Power dredging for oysters in the Nanticoke is shown (4). The oysterman on the pier (1) is tending a "wet storage" operation in which harvested oysters are suspended live in "float" containers under water by use of ropes and winches until ready for processing. In a processing plant (5), shucked oysters are washed with clean ice water in a

(Continued following page.)

"blow tank," which removes impurities and brings temperature down to 38-40° F. for storage and shipping. Checking are William Russell (center), FDA Baltimore District Inspector, and Frank Hobbs (right), Chief, Shellfish Section, Maryland Department of Health Division of Food and Milk. Live whole clams are desanded in clean salt water treated with chlorine and ultraviolet light to kill bacteria (6). The chlorine is later removed from the water. Mr. Hobbs (right) watches with the plant owner and a plant employee. Clam shucking is shown in a packing plant (7). Charles Harmon, a Wicomico County sanitarian's aide, takes a sample of water (8) from the bottom of an oysterbed for coliform bacteria analysis. Detail (9) shows how the stopper stays in the bottle until the holder hits bottom, is unstoppered when tension is released on the string, and restoppered when lifting retightens the cord.

to insure the future safety of shellfish. Both the concepts and the agencies represented at the conference are still very much in evidence today in the National Shellfish Sanitation Program--a consumer protection program that has made considerable progress in strengthening sanitary controls, administrative procedures, and State regulatory activities.

Each member of the National Shellfish Sanitary Program's three-way State, Federal, and industry partnership has a defined area of responsibility. The basic premise of the Program is that coordination and uniformity of control may be achieved best by mutual agreement among the States, which individually bear the chief responsibility for the sanitary control of the shellfish industry. The Federal Government coordinates program activities through the Food and Drug Administration, which assumed the shellfish sanitation function after a reorganization within the Public Health Service. FDA is responsible for operating the Federal Government's share of the program through administrative and technical machinery in its new Bureau of Compliance. A Shellfish Sanitation Branch has been established and staffed with personnel who were associated with the program in its former PHS location.

All the coastal shellfish-producing States participate in and subscribe to the procedures outlined in the National Shellfish Sanitation Program's manuals of operation, which have been published by the Public Health Service. The States have adopted uniform rules and regulations administered principally by health and conservation agencies for the sanitary control of the shellfish industry. Their responsibilities span a total range of controls which begin at the shellfish growing areas and continue through the processing and distribution phases. Typically, a shellfish control agency makes sanitary and water quality surveys of growing areas, classifies and patrols closed shellfish waters, inspects harvesting methods and shellfish plants, makes laboratory investigations, and provides any additional surveillance measures necessary to assure that the shellfish that reach the consumer have been grown, harvested, and processed under sanitary practices. The State health departments issue operating certificates to those shellfish shucking, packing, repacking, and shellstock plants whose equipment, method of operation, basic construction, and product meet cooperative program standards. Every package of fresh or frozen oysters, clams, or mussels shipped in interstate commerce from a State certified plant has been marked with an identifying number preceded by an abbreviation of the State name. These "certified shellfish" are guaranteed to have been grown, processed, and packaged under strict sanitary controls.

It is not easy for States to apply the necessary controls. Trained and experienced personnel are needed in the biological and physical sciences, public health, engineering, law enforcement, and several other disciplines to effectively administer an adequate sanitary control program. State agencies employ a total of 1,200 such personnel, either full or part time. The bulk of their effort is in making comprehensive surveys and resurveys of shellfish-growing waters, and preventing illegal harvesting of shellfish from closed areas. A joint study by the Public Health Service and States in 1965 disclosed that two million acres of shellfish waters have been closed or restricted to the taking of shellfish. A total of 8.2 million acres are approved. The national trend is to close more estuarine waters where the shellfish grow, because they fail to meet the rigid water quality requirements of shellfish-approved waters.

FDA's part in the Shellfish Sanitation Program is not only a continuation of former PHS activities, but also a strengthening of the coordination and assistance given to a State program. The FDA field staff, headed by Regional Shellfish Consultants in the six HEW Regions that have coastal waters, will continue to conduct annual evaluations of State control programs. Each review will include an analysis of the legal and general administrative procedures, inspection of a representative number of shellfish plants, and review of laboratory procedures and the effectiveness of closed area patrols. From the information thus obtained, Federal endorsement of a State program is either given or withheld, depending on the State program's degree of compliance with national program standards. This regulatory procedure is a strong incentive for the State control agencies and the shellfish industry to encourage and follow good sanitary practices and to comply with the Manuals of Recommended Practice, issued jointly with the National Shellfish Sanitation Program participants.

Every 2 weeks, the FDA will be issuing the familiar national list of some 1,400 State-certified interstate shellfish shippers for the information of food control officials throughout the country. FDA would like to see a greater distribution and use of this list to assure that consumers get shellfish from certified sources.

Cooperative efforts to combat pollution of the water habitat of shellfish is a never-ending job and the smallest relaxation of vigilance could result in a fresh outbreak of some health hazard to shellfish consumers. Beginning in the 1960's, there have been seven outbreaks of infectious hepatitis, affecting 867 people, associated with the consumption of shellfish harvested from polluted waters. Although the hepatitis virus is still to be isolated by the laboratory, recurrence of such outbreaks can be and is prevented through the effective application of program standards based on the use of indicator organisms.

Responsible Federal and State officials must continue to promote fundamental and applied research. FDA will obtain shellfish research support from three laboratories administered by the Environmental Control Administration. These facilities are located at Purdy, Wash., Dauphin Island, Ala., and Narragansett, R. I. In addition, research grants also will be available to qualified nonprofit institutions with worthwhile study projects in shellfish sanitation problems. A total of 11 such grants totaling $690,000 has been committed for the current (1969) fiscal year.

If conditions affecting our estuaries remained unchanged, the need for research and technical assistance to other Federal departments and State agencies would not be great. But the rate of man-induced degradation of our estuaries is alarming. Each time a ship channel is dredged, a new sewage treatment plant is constructed, a subdivision is made possible by filling a salt marsh, or a new industry locates near shellfish-growing areas, the possible changes these alterations may cause in the water quality must be evaluated. National Shellfish Sanitation participants are working with conservation groups, water pollution agencies, water resource planning agencies, and fishery groups to try to protect and preserve the remaining natural oyster beds and clam flats from pollution. Enhancement and restoration of some shellfish resources may be achieved through concerted and cooperative efforts, but more rigorous pollution prevention and abatement action is needed to reverse the national trend of simply closing productive shellfish-growing areas subjected to hazardous pollution.

FDA will continue to provide the leadership and coordination necessary to focus attention on the needs of State agencies and will offer technical assistance and training programs for State and local health and conservation personnel. For assistance to State agencies in special studies, laboratory methods, consultation, and training, FDA has two Technical Service Units, one located at Dauphin Island, Ala., and the other at Davisville, R.I. Some current activities in these units include studies about the effectiveness of practices involving chlorination of sewage effluent, the fate of those bacteria of sanitary significance in estuaries, the effect of dumping sewage sludge at sea, ways to naturally purify polluted shellfish, and the design of cold water wash systems for chilling shellfish.

Periodically, members of the National Shellfish Sanitation Program meet at workshops to discuss proposed technical and administrative changes, new developments, and research findings. In recognition of the past history of the shellfish industry in the United States and of the relationship of the National Shellfish Sanitation Program to the effective use of this natural resource, the 1964 National Shellfish Sanitation Workshop endorsed the following principles:

1. Shellfish are a renewable, manageable natural resource of significant economic value to many coastal communities, and should be managed as carefully as other natural resources such as forests, water, and agricultural lands.

2. Shellfish culture and harvesting represents a beneficial use of water in the estuaries. This use should be recognized by State and Federal agencies in planning and carrying out pollution prevention and abatement programs and in comprehensive planning for the use of these areas.

3. The goals of the National Shellfish Sanitation Program are: (1) the continued safe use of this natural resource, and (2) active encouragement of water quality programs which will preserve all possible coastal areas for this beneficial use.

The more progressive oyster and clam fishermen are looking to the future for ways to effect better controls over the growing, harvesting, and processing of shellfish. Culturing methods that are being successfully used in Japan and some of the European countries on the Atlantic and the Mediterranean offer one way to avoid some of the calamities that beset shellfishermen who in this country rely mainly on Nature's vicissitudes to provide a sustaining crop year after year. Controlled cultivation and adoption of good conservation practices have provided the more resourceful U.S. shellfishermen with a dependable supply and uniform quality product.

In those countries that practice extensive artificial shellfish culture and scientific shellfish farming controlled breeding, selection of disease resistant strains, and close scrutiny from spat or juvenile stage to market size have produced desirable characteristics and made high-yield shellfish farming possible. These controlled methods allow harvesting of excellent market quality oysters within a year to 18 months after spawning. Because of site selection and preservation, these techniques offer relative freedom from contamination by human diseases. The oysterman and the clammer in this country may be able to return to something of their former production levels by taking better advantage of such proved culturing methods.

We believe that the shellfish sanitation program of the United States, which is administered jointly by the States, the Food and Drug Administration, and the shellfish industry, has been highly successful in preventing transmission of disease through shellfish. We believe the program affords a challenging example of the achievements that are possible through cooperation of the State agencies, the Federal Government, and the affected industry. This general type of program will be continued by the FDA, subject only to those modifications necessary to meet changing conditions. Program improvements will be effected through increased research, development of better standards, assurance of adequate surveillance by State and FDA shellfish sanitation personnel, and through an increased awareness of the program objectives in shellfish receiving areas. FDA will make every effort to ensure and maintain consumer confidence in a safe and wholesome shellfish product.

OCEANOGRAPHY

New Ocean-Current Tracking System Tested Successfully

ESSA has tested successfully a new ocean-current tracking system that uses a satellite and a free-drifting buoy. This system also can provide satellite transmittal of oceanographic and atmospheric data collected by the drifting buoy. The test was conducted in the Gulf Stream by ESSA and NASA.

Test's Significance

The test represents the first successful attempt at tracking a free-drifting buoy in the deep ocean with satellite telemetry. M. E. Ringenbach, Acting Director, Engineering Development Laboratory, Rockville, Md., said: "The potential implication to the public and to the community of environmental scientists, as a result of the success of this experiment, cannot be overemphasized. Not only can ocean currents be traced accurately in this manner, but sensors on the drifting buoy can acquire oceanographic and atmospheric data, which can be transmitted with the navigational information. Through this technique, oceanographic and atmospheric data can be acquired from remote regions of the world."

The Test

In the test, a buoy equipped with Omega Position Location Equipment (OPLE) was allowed to drift freely in the Gulf Stream off Florida's east coast. An Applications Technology Satellite (ATS-3) interrogated the buoy upon command. The buoy's navigational data were relayed through the satellite to the Goddard Space Flight Center at Greenbelt, Md., for processing.

The buoy was released about 15 miles off Miami, permitted to drift 24 hours, and recovered about 18 miles off West Palm Beach. It had traveled 66 nautical miles. During its course, it was tracked concurrently by an ESSA Coast and Geodetic Survey launch, by the 'Gulf Stream' (an oceanographic vessel operated by Nova University of Ft. Lauderdale, Fla.), and via satellite by NASA in Greenbelt, Md.

A drogue chute was attached to the buoy at a depth of 90 feet. As a result, the buoy's movement was affected primarily by ocean current, not by wind and waves.

New Nautical Chart Issued for New England Coast

A new small-craft nautical chart covering New England's coastal waters from Boston, Mass., to Portsmouth, New Hampshire, has been published by ESSA's Coast and Geodetic Survey.

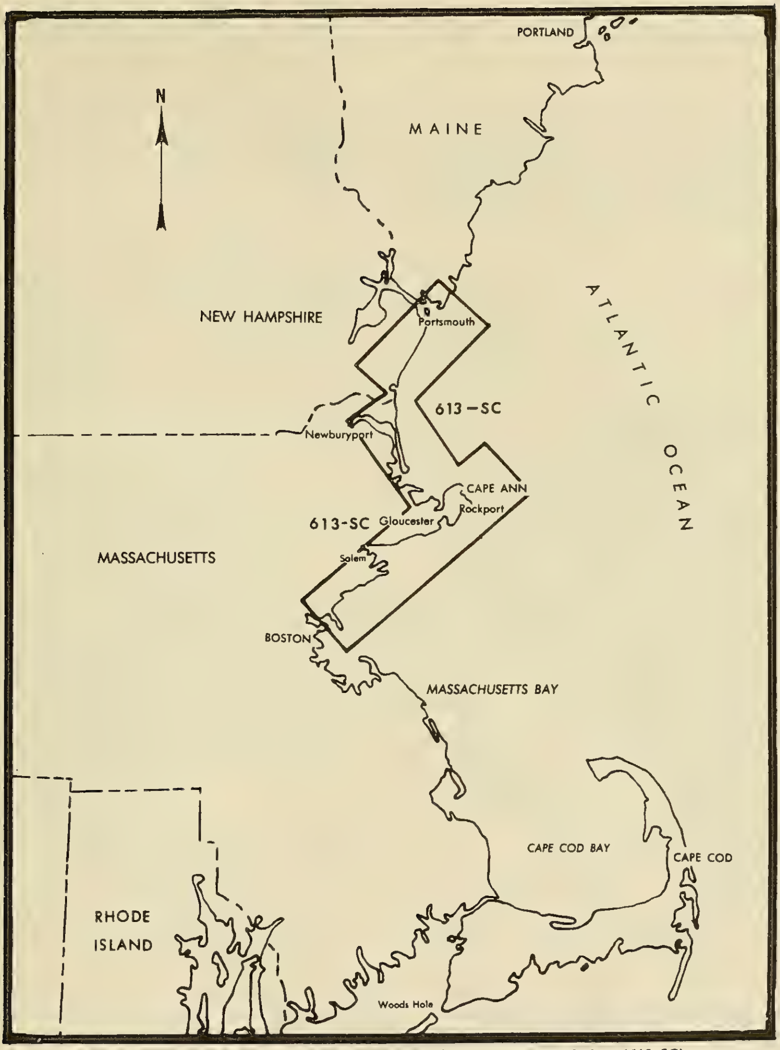
The accordion-folded chart (613-SC) is on a scale of 1:40,000. It is sufficiently detailed to provide safe and efficient navigation for a large part of the more than 100,000 small craft registered in Massachusetts and New Hampshire. The harbors of Boston, Portsmouth, Salem, Gloucester, Rockport, and Newburyport, all shown, support much commercial and recreational boat traffic.

Fishermen's Favorite Area

Color and infrared photography taken by the Coast and Geodetic Survey in 1965 was used in the chart's development to depict the rocky coast and offshore features. Hydrographic information was updated from 1967 Coast and Geodetic Survey surveys near Cape Ann.

This section of the New England coast has been a favorite of sport and commercial fishermen since the days when whalers put to sea from the area. In 1967, commercial fishermen from Massachusetts and New Hampshire caught nearly 400 million pounds of fish and shellfish worth about 40 million dollars.

Chart 613-SC may be purchased for $1.50 from Coast and Geodetic Survey agents, or from Coast and Geodetic Survey (C44), Rockville, Md. 20852.



Blocked area shows region covered by ESSA's new small-craft nautical chart (613-SC).

New Bathymetric Map of Bering Sea, Alaska

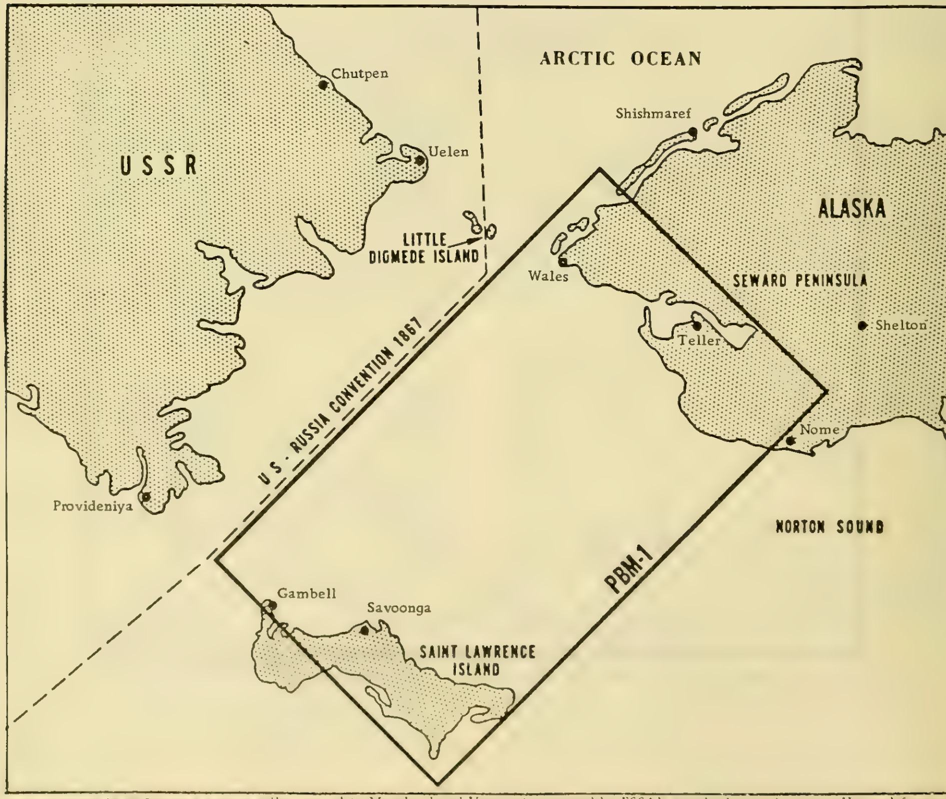
A new ESSA bathymetric map of the bottom of the upper Bering Sea shows an extensive, relatively flat, basin about the size of Maryland and Vermont combined. An unusual feature of the 19,000-square-statute-mile basin is that it drains generally to the north toward the Arctic Ocean.

The Area Covered

The map (PMB-1, scale 1:250,000) provides the most detailed bottom topography ever published for the area. The area is bounded roughly by Seward Peninsula and Norton Sound to the east, Little Diomede Island to the north, St. Lawrence Island to the south and, on the west, by the U.S.-Russian Convention line, established in 1867 to separate the 2 jurisdictions. The sea floor adjacent to the Seward Peninsula and St. Lawrence Island is marked by numerous narrow ridges and basins.

Map Is Preliminary

The map is a preliminary one. It will be replaced after new surveys have been completed. It is the first of the Continental Shelf series to include overlays showing geophysical displays of gravity and magnetics besides bathymetry. The geophysical overlays are expected to be available by September 1.



Seabottom of 19,000 square statute miles, equal to Maryland and Vermont, covered by ESSA's new bathymetric map. Unusual feature of the largely flat undersea basin is that it drains toward the Arctic Ocean.

Chart Entrance to Alaska's Inland Waterway

ESSA's Coast and Geodetic Survey has published a new nautical chart (8080) for the entrance to Alaska's Inland Waterway. It provides the first detailed chart coverage for such major commercial waterways as George and Carroll Inlets, Thorne Arm, Revillagigedo Passage, and Nichols Passage.

The large-scale detail (1:40,000) displays the new aids to navigation, harbor improvements, and new topographic and hydrographic surveys conducted to 1965.

To Aid Industries

It is believed the new chart will aid the fishing, lumbering, mining, and petroleum industries, which transport their products by sea.

Chart 8080 may be purchased for $1 from Coast Survey Nautical Chart agents, or from Coast and Geodetic Survey (C44), Rockville, Md. 20852. (Chart on following page.)

Fluke's Migrations Are Being Tracked

A cooperative effort to track the migrations of the fluke, or summer flounder, has been launched by the American Littoral Society (ALS) and the Sandy Hook Marine Laboratory, reports Graham Macmillan, Society vice president.

He said: "Marine biologists are concerned about the recent rapid decline in fluke catches. Our members are all volunteer fish taggers and I know they will respond to this study of fluke migration and growth rates."

L. A. Walford, director of the Sandy Hook Marine Laboratory, notes that commercial fluke catches from Massachusetts to Virginia dropped from 19 million pounds to 8.4 million pounds in the last 10 years. Sport-fishing catches also have declined.

At the Sandy Hook Marine Laboratory, tank studies on adult fluke are underway. Offshore expeditions have been sampling waters for spawning fluke and for fluke larvae and fry.

Spawning Areas & Season

Marine biologists have found that fluke spawn in the fall in areas 10 to 30 miles offshore from Cape Cod, Mass., to Cape Lookout, N. C. When they are less than an inch long, they migrate into estuaries. There, they live for a year before venturing again into the open ocean. Some biologists believe juvenile fluke survive well only in southern waters--and that Long Island waters are supplied mostly by North Carolina fluke.

Much of this is theory, ALS states. But, it is a fact that in recent years no baby fluke have been reported from waters north of Chesapeake Bay.

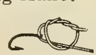
Urges Members' Help

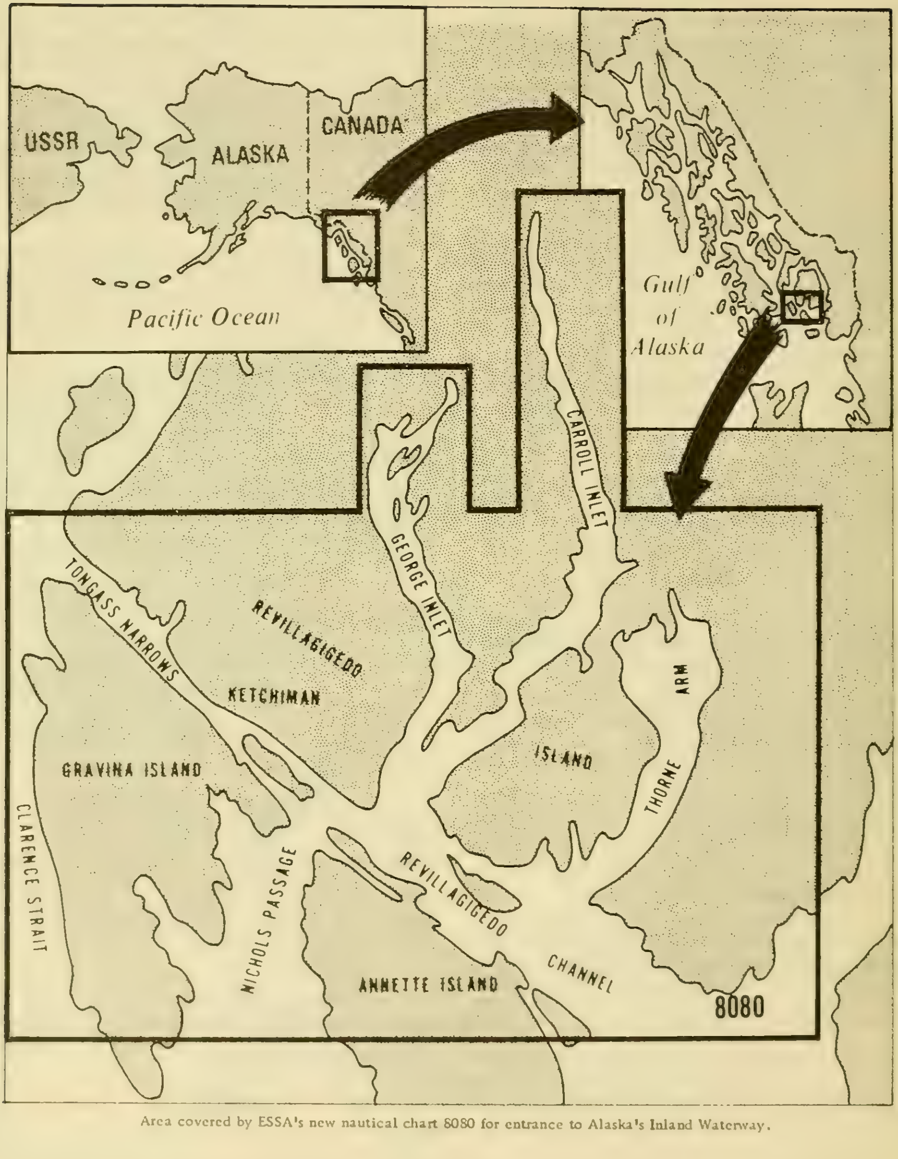
ALS members will be urged to tag and return as many fluke as possible over the next 2 summers. The members will collect samples of very small fluke in estuaries north of the Chesapeake. The results of tagging returns are published in ALS' journal. They are made available to marine biologists and to the Atlantic States Marine Fisheries Commission because of the Commission's interest in the status of coastal fisheries resources.

Since ALS' tagging program began 5 years ago, its members have ordered over 15,000 tags. These tags are the "spaghetti" type inserted through the fish's body behind the dorsal fin. While volunteer taggers have concentrated on striped bass, they also have tagged flounder, sailfish, tarpon, shark, bluefish, bonefish, grunt, spot, cod, croaker, tautog, tuna, bonita, dolphin, pike, smallmouth and largemouth bass, and muskie.

Macmillan notes: "Our members are sportsmen in every sense of the word and will be most interested in helping marine biologists preserve a species on the wane. We are asking fishermen to tag a fish that they love to catch and love to eat. We know that many will choose to tag and return some of their catch--hopefully, one for science, one for the pan."

Dr. Walford hopes that fishermen will tag the undersized fish they have to throw back. "We are especially interested in the wanderings of the young fluke."





Area covered by ESSA's new nautical chart 8080 for entrance to Alaska's Inland Waterway.

Foreign Fishing Off U.S. in May 1969

OFF ALASKA

Soviet: A sharp decline began in April and continued in May. Gulf of Alaska shrimp fishery ended, and the king crab and groundfish fleets withdrew from eastern Bering Sea. Nearly 80 vessels were sighted in early May; 21 remained at month's end (nearly twice as many as at end of May 1968).

Pacific ocean perch fishing along the Aleutians increased from 5 stern trawlers to 10 stern trawlers and 1 refrigerator, primarily in Samalgo-Seguam Passes region, in eastern and central Aleutians. However, at least 2 stern trawlers were fishing off the western Aleutians by late May. The western Gulf fishery declined rapidly--10 stern trawlers and 2 refrigerated fish carriers in first week, 2 stern trawlers by mid-month, and 1 stern trawler at end. Catches were poor, both in the Gulf and off Aleutians.

Five medium side trawlers and a refrigerator fished bottomfish along Continental Shelf edge in central Bering Sea through May. Two medium trawlers fishing west of the Pribilofs were joined by 2 stern trawlers in late May. Sablefish, Alaska pollock, arrowtooth flounder, and rockfish were trawled in depths down to 500 fathoms. A 20-vessel fleet that had shifted from flounder to pollock and sablefish, south of the Pribilofs, had shrunk to less than 10 by mid-month. It disbanded in a few days after shifting to fishing off the Alaska Peninsula.

Apparently king crab catches again were poor this year. The 2 tangle-net fleets withdrew in mid-May. In 1968, they had withdrawn by May 2, with a total catch of 22,442 cases. This year's catches are probably not much larger--far below the 52,000 case catch quota.

By mid-month, 2 fleets fishing shrimp east of Kodiak Island had joined a third in the western Gulf, east of the Shumagins. The Soviets said that catches east of Kodiak were not good and that they had been hampered by bad weather. Catches observed east of the Shumagins appeared to be good. All 3 fleets had withdrawn by late May, about the same time as in 1968.

Japanese: The arrival of part of the 1969 high-seas salmon fleets, and of herring fishing vessels off Bristol Bay and in Norton Sound, raised the number of vessels to over 300 by end of May.

The longstanding ocean perch fishery in the Gulf was at a low level; only 2-3 stern trawlers were fishing, primarily in the western Gulf. Perch fishing along the Aleutians was observed in early May. By month's end, 2 stern trawlers were intermingled with the Soviets' in the Samalga-Seguam Passes region, and a third was near Amchitka Island.

About 10 stern trawlers, taking pollock, sablefish, arrowtooth flounder, and ocean perch, remained along the Shelf edge in eastern and central Bering Sea throughout month.

By mid-May, 2 more factoryship fleets had joined the minced meat and meal fishery in eastern Bering Sea, making a total of 5 factoryships and about 84 trawlers. During first half of month, all 5 fleets centered on the Continental Shelf, northwest of Unimak I. About mid-May, 2 shifted to the Shelf edge north of the eastern Aleutians.

Two to 3 longliners sought sablefish in the Gulf, one off southwest Kodiak Island, the others off southeast Alaska.

By mid-month, the 2 crab fleets had moved from outer Bristol Bay to east of Pribilofs. Unlike Soviets, they fished both tangle-nets and pots, and sought tanner rather than king crab. The 2 fleets are expected to continue until summer or early fall to achieve the quotas of 85,000 cases of king crab, and 16 million tanner crabs (principally frozen in sections).

The 11 factoryship fleets in the high-seas salmon fishery left Japan May 15. By end of May, 4 fleets (132 gill-net vessels) were located far south of western Aleutians.

In mid-May, at least 14 stern trawlers, 3 smaller trawlers, and 6 longliners fished herring south of Togiak Bay, in northern Bristol Bay. The longliners, and some stern trawlers, fished with surface drift gill-nets. A second gill-net fishery for herring, with at least 2 longliners, was sighted in Norton Sound. (Japan had conducted a similar fishery in same areas April-June 1968.)

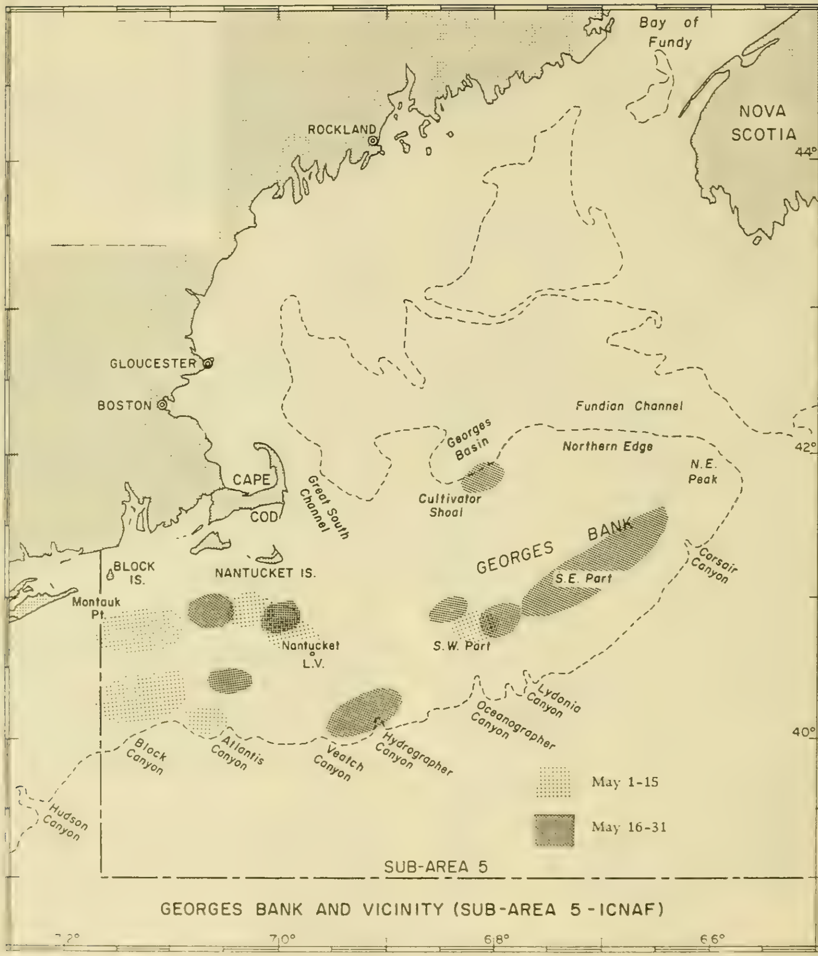


Fig. 1 - Principal New England waters fished by foreign vessels during May 1969.

South Korean: The lone factory trawler that had fished about a month along Shelf edge in eastern Bering Sea returned home by mid-May.

In early May, a second South Korean fishing operation--1 processing refrigerator and 5 small trawlers--appeared. This fleet was observed when it sought shelter in U.S. territorial waters on northwest Unimak I. It was reported nearly identical to a fleet that had fished unsuccessfully in 1967 and 1968; that fleet took very small catches of pollock. In late May, a second refrigerator and another trawler joined the fleet.

OFF PACIFIC NORTHWEST

Soviet: Twenty-eight stern trawlers, 15 side trawlers, and 12 support vessels were sighted. Most had come from off California. They fished almost entirely off Oregon, until last week of May, when 10 vessels moved north off Washington, Large catches of Pacific hake were observed. Some side trawlers had an estimated 20,000-30,000 pounds in their nets, and substantial quantities on the decks. A large single tow aboard one stern trawler was estimated at about 80,000 pounds. (In May 1968, 56 vessels had been sighted.)

Japanese: No fishing vessels were sighted during May. (Two stern trawlers and 2 support vessels had been reported in 1968.)

OFF CALIFORNIA

Soviet: On May 1, 12 stern trawlers were sighted fishing between Cape Mendocino and the Oregon border. One side trawler was southwest of San Francisco. On May 5, an observation flight failed to sight any vessels between Monterey and the Oregon border. (In May 1968, 8 Soviet vessels had fished off California.)

GULF OF MEXICO & SOUTH ATLANTIC

No foreign vessels were reported in May.

NORTHWEST ATLANTIC

For a third month, good weather afforded excellent surveillance of New England and Middle Atlantic coasts; 201 individual foreign fishing and support vessels were sighted--18% less than the 237 reported in April. (In May 1968, 207 vessels had been sighted.)

The Soviet fleets included 27 factory stern trawlers, 116 medium side trawlers (131 in April), 4 factory base ships, 1 refrigerated fish transport, 3 tankers, and 1 tug.

OFF SOUTHERN NEW ENGLAND & GEORGES BANK

Soviet: Throughout month, large groups of vessels were dispersed from south of Block Island, R.I., to eastern slopes of Georges Bank. Fishing in those areas increased early in May, when Soviet vessels gradually moved eastward from the mid-Atlantic off New York and New Jersey.

During first half of May, 90 vessels, mostly side trawlers, took herring and some mackerel in a 30-40 mile area, 50-60 miles south of Block Island. Smaller groups, about 50 vessels each (stern and side trawlers), were 24-40 miles south of Nantucket. Those 25 miles south were mostly stern trawlers fishing red hake. A group of stern trawlers has been fishing red hake in this general area since January 1969.

After mid-month, the main fleet shifted to south of Nantucket and the southwest part of Georges Bank. Catches were primarily herring. At month's end, the fleet was spread along eastern slopes (southwest and southeast parts) of Georges Bank, fishing in 30-40 fathoms. Catches were mostly herring. A sizable fleet, including about 20 stern trawlers, remained south of Nantucket fishing red hake.

Late in May, U.S. fishermen sighted about 100 foreign vessels, largely side trawlers, along southeast part of Georges Bank and Cultivator Shoals. The fishermen said 30-35 were seining herring with huge purse seines and power blocks. A BCF Agent, observing from a USCG cutter, May 27-29, reported 44 Soviet vessels fishing in 35-40 fathoms on northeast part of Georges Bank, 15 miles north of Corsair Canyon. About 35, mostly SRTR's, were rigged for purse seining. The gear was used off the starboard side. Seines were deep-water type. Two large power blocks were aft of the superstructure. Fish were brailed out of the seine by a long-handled dip net and lifted on deck. Catches were mostly herring, but fish on one vessel appeared to be pollock. At least 3 factory base ships and 2 refrigerated fish transports were heaped with barrels.

(During April 1968, at least 9 Soviet medium trawlers equipped for purse seining

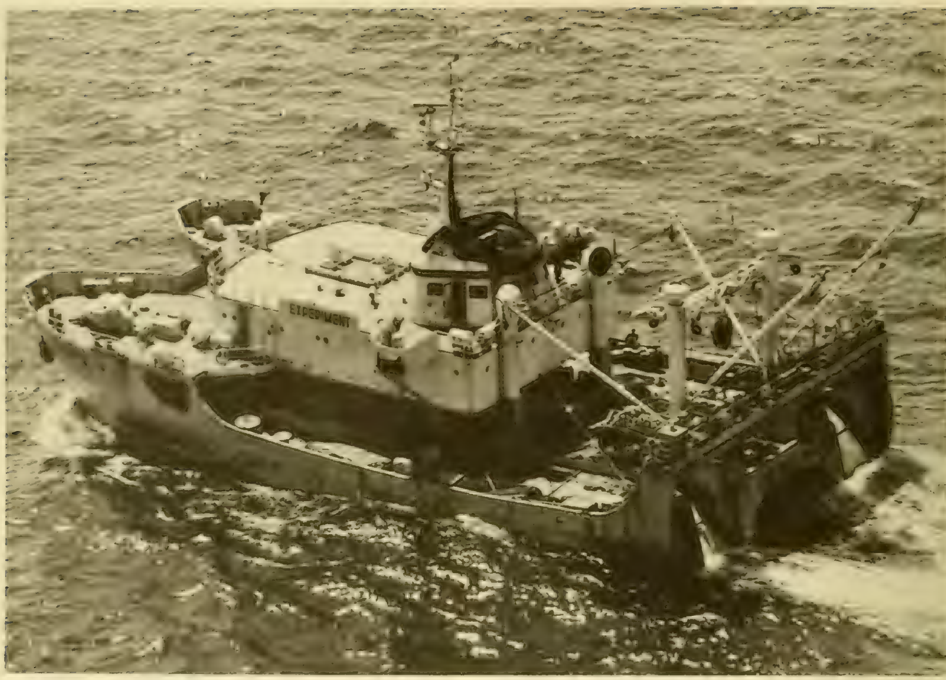


Fig. 2 - Catamaran trawler 'Experiment.'

were sighted off Long Island, N. Y., and Block Island. Seven were actually seen seining for herring. In September 1968, the Soviets had indicated that purse seining off U.S. coast was exploratory, but that favorable results could lead to a more extensive fishery. Seining was described as a lower-cost operation than conventional trawling.)

The catamaran trawler 'Experiment' was sighted on May 27, about 55 miles south of Martha's Vineyard. The first of her kind, she was undergoing sea trials off New England. The 1,000-displacement-ton twin-hulled vessel, tested earlier in the Baltic, is said to have better maneuverability and stability than single hull trawlers. Each of Experiment's 2 hulls is shaped like a conventional SRT-300 medium side trawler, with 2 stern ramps and trawl decks for continuous fishing. She can be used for bottom and midwater trawling and purse seining.

Greek: During mid-May, the trawler 'Paros' was sighted on the Cultivator Shoals area of Georges Bank.

OFF SOUTHERN NEW ENGLAND & MIDATLANTIC COASTS

Soviet: About 30 vessels fished off New York and New Jersey, substantially fewer than the 100 sighted in April. The decrease was caused by an eastward shift of fishing operations to areas off southern New England and Georges Bank.

Early in May, 9 medium side trawlers were 55-60 miles south of Moriches Inlet, L. I. Large catches of herring and mackerel were observed on deck. Five factory stern trawlers fished 80 miles east of Cape May, N. J., but no catches were observed.

By mid-month, 27 vessels (mostly side trawlers) were in a 20-mile area 65 to 85

Fig. 3 - Cuban freezer stern trawler (Atlantik class) 'Playa Giron.' Sighted during May 1969 south of Block and Nantucket Islands. (Photos - C. Philbrook, BCF.)

miles east of Atlantic City, N. J., 10 to 30 miles southwest of Hudson Canyon. Limited catches appeared to be herring.

Polish: Three factory stern trawlers, 25 large side trawlers, 1 factory base ship, and 5 transport vessels were sighted.

During first half of month, 20-30 vessels shifted back and forth, from Long Island to south of Martha's Vineyard and Nantucket. Moderate catches were mostly herring, with some mackerel. From mid-month, 20 to 25 were dispersed from south of Nantucket to the eastern slopes of Georges Bank. Catches were mostly herring. (A year ago, 25 to 30 Polish vessels had fished off New York, New Jersey, and southern New England.)

East German: Three stern trawlers and 8 side trawlers fished among the Polish and Soviet fleets off southern New England. A few vessels were scattered off Long Island and, late in the month, along the eastern slopes of Georges Bank. Catches were identified as herring.

Japanese: Early in May, 2 stern trawlers fished 85 miles south of Nantucket, and 65 miles south of Montauk Point, L. I. No catches were noted and no further sightings were made.

Cuban: One factory stern trawler, 'Playa Giron,' was sighted among other foreign vessels south of Nantucket. No catches were noted. This may be the first sustained Cuban fishery off New England.

Bulgarian: A stern factory trawler was sighted in early May fishing about 80 miles southeast of Cape May. In late May, she was about 60 miles south of Martha's Vineyard. This was the first sighting of a Bulgarian fishing vessel off U.S. coasts. Bulgarian sources have been predicting the beginning of this fishery for several years. No catches were observed, but it is believed she was seeking herring and mackerel.

STATES

Alaska

GOV. MILLER SIGNS 'COAST' COMMISSION BILL

Gov. Keith H. Miller of Alaska has signed legislation creating the Commission for Ocean Advancement through Science and Technology. He said: "With the COAST Commission established, we can proceed with development of a comprehensive coordinated State plan for the wise multiple use and conservation of our marine and coastal resources."

The Law

The law provides for a 10-member commission: 5 Alaskans experienced in oceanographic resources and problems, and 5 non-State members. The Commission is charged to begin a comprehensive study of the marine sciences and the marine and coastal environment in and near the State.

* * *

BCF METHOD SPURS KODIAK'S SEAFOOD WASTE MANAGEMENT

Kodiak plans to ask the Federal Water Pollution Control Administration for a demonstration grant to apply the process for shellfish waste utilization developed by Food Chemical and Research Laboratories under BCF contract. This decision followed meetings coordinated by BCF's Ketchikan Technological Laboratory staff. It culminated in a State-sponsored public meeting in Kodiak on May 21 to discuss harbor pollution.

Plant & Process

A plant would be designed to handle over 80 million pounds of waste now being dumped into Kodiak's harbor each year. The plant would cost more than one million dollars. It would operate by 1971.

The process separates the waste material into 3 products: (1) a high-quality protein concentrate, (2) a calcium chloride brine, and (3) chitin for marketing as valuable separate products.

* * *

PAN ALASKA ORDERS 5 MULTIPURPOSE VESSELS

Pan Alaska Fisheries, Inc., has ordered 5 multipurpose king-crab fishing vessels totaling about $1,800,000. It is the largest single order ever placed in the king-crab industry. The 93-foot steel-hulled ships are to be owned and operated by the firm.

Capabilities of Vessels

The new vessels are designed to be fully adaptable to the other types of fishing in Northern waters. Besides their king crab capabilities, the sea-water-tanked vessels can be used for scalloping, and in other trawling for bottom fish and shrimp.

Oregon

TUNA SCOUTS SAIL ABOARD 'SUNRISE'

The Oregon Fish Commission's tuna scouts sailed from Astoria June 28 aboard the chartered vessel 'Sunrise' on their annual 800-mile search for early arriving albacore tuna off Oregon's coast. The researchers will monitor oceanographic conditions and test-fish for tuna 30 to 120 miles offshore on the cruise down the Oregon coast to the California border.

Daily radio contact with the commission's Astoria research laboratory will advise researchers and fishermen of ocean conditions and the location of albacore concentrations. This information will be relayed to Oregon tuna fishermen, Oregon State University Marine Science Center, and to BCF, La Jolla, Calif., headquarters for news dissemination to the entire Pacific tuna fleet.

Warm Water Important

The abundance of the elusive albacore off Oregon is related directly to the presence of warm water. Fish Commission biologists are encouraged about Oregon albacore fishing prospects this year because of water temperatures. Through June 15, these were comparable to those through that date last year,

when landings set a record of almost 38 million pounds.

Larry Hreha, Astoria-based biologist in charge of the tuna exploration, believes Oregon will have another good season in 1969--at least about 20 million pounds or more. Through June 23, he reported, there were no known tuna catches in California waters. This was a fairly good indication the fish will be found off Oregon again this season.

* * *

RECORD SALMON RUN TO FLOOD-CONTROL RESERVOIR

More than 4,000 adult spring chinook have returned to Fall Creek Dam from a 1966 release of 1.1 million unfed fry, the Oregon Fish Commission has disclosed. It was Oregon's most successful attempt to introduce and rear salmon in a flood-control reservoir.

The project on Fall Creek was completed by the U.S. Army Corps of Engineers in 1965. It has upstream and downstream migrant collection facilities. Rough fish in the stream were eradicated before it was filled. Then, early in 1966, 1.1 million spring chinook fry surplus to the Fish Commission's Willamette hatchery were planted in Fall Creek above the dam. They reared that summer in the reservoir and reached an average of 7 inches before emigrating during December 1966 and January 1967.

Survival Exceeds Commission's Hopes

The collection facility was monitored, but the exact number of juveniles that migrated from the reservoir is not known because many escaped through the dam's regulating outlet and could not be counted. However, the spectacular return shows that survival far exceeded the commission's hopes.

It was difficult to get young fish into the dam's collection "horns" or exits, but the Engineers' procedure of drawing the reservoir down for the anticipated spring run-off helped. Again this past year, the Fish Commission asked the Corps to evacuate the reservoir completely to aid juvenile emigration and to flush out predators above the dam.

The Return

On returning, the 4,000-plus adults, all 4-year-olds, enter a short fish ladder leading into a trap. The collected salmon, along with other species, are then put into an "anesthetic tank." Rough fish are thrown away and the game species are hauled to a destination above the dam by Corps personnel.

Plants have been made each year since the first in 1966. In 1970, even more can be expected back because both 4- and 5-year-old fish will be returning.

The Fish Commission says this return is an example of the tremendous potential in reservoir-rearing of fish. Its earlier studies revealed excellent growth and survival of juvenile salmon in reservoirs when there were few predators. The commission adds that this does not necessarily mean all dams are good for fishery resources; on the contrary, many problems at dams are unsolved. However, certain impoundments may have considerable potential to enhance a fishery if they are constructed and operated so the young downstream migrants are able to emigrate.

Juvenile Fish

Most attempts at juvenile salmonid passage so far have been unsuccessful because of inadequate collection systems, especially at high dams. Also, at the high dams, there often is no spill and the juvenile fish may not "sound" or go down to enter the low-level entrance of the turbines. So, in the past, runs affected by such structures either have been forfeited or transferred to a hatchery.

Recent commission studies have confirmed that some nonpower-producing flood-control projects might be used to rear salmon without provisions for expensive and complex collection facilities for juvenile fish. One method of passing salmon smolts at these projects can be accomplished by evacuating a reservoir to the level of the stream bed each winter; this is now being done at Fall Creek reservoir.

The Fall Creek study is only one of 7 begun in the mid-50s to evaluate fish passage and fish behavior at public and private projects. The study is guided by a steering committee representing the Corps of Engineers, Oregon Game Commission, the Oregon Fish Commission, BCF, and the Bureau of Sport Fisheries and Wildlife.

* * *

LAST PART OF WILLAMETTE FALLS FISH LADDER BEING BUILT

Construction began June 26 on the third and final phase of the $4-million fishway at Oregon City's Willamette Falls, reported Ed Neubauer, Director of Engineering for the Oregon Fish Commission. The fishway is funded by BCF (partly by Portland General Electric).

The construction of a 750-lineal-foot ladder and 2 more fishway entrances will greatly improve fish-passage conditions. Also, the perennial "wet hole" problem will be resolved. By filling and capping this pothole, a notorious salmon death-trap on the falls' east side will be eliminated. The naturally occurring holes create a problem each year as the spring flows recede. Previous efforts to remove the stranded fish alive were unsuccessful.

Salvaging Fish

To salvage the fish, commission biologists are gillnetting the wet hole day and night. Carcasses are given to Clackamas County for use in its institutional food program.

Spring chinook escapement above the falls was good this year. The commission's Willamette River hatcheries already have enough returnees to satisfy their artificial-propagation needs.

Maine

MECHANIZED SARDINE-PROCESSING EQUIPMENT TO BE TESTED

Mechanized sardine-processing equipment from Stavanger, Norway, will be tested by the Maine Sardine Council in an attempt to improve and modernize the entire Maine sardine industry. The machinery will be installed in a canning plant at Prospect Harbor.

Goal of Production Test

The Council's Executive Secretary, Richard E. Reed, explained the project. The primary goal is to deliver uniform-size fish speedily and efficiently--with heads and tails removed--to the women who place them in the cans. This would loosen a time-consuming and costly production bottleneck.

He said the Council decision to obtain sufficient equipment for a full-scale commercial production line resulted from promising pilot tests made last year. The tests indicated that production can be increased as much as 100% with uniform precut fish. Also the work will be much pleasanter and easier. Traditionally, the cutting is done with hand-held scissors.

Production Line

The production line will consist of a fish sorter or size grader. Three automatic devices will orient and head the fish in one direction and feed them into a high-speed cutter. The cutter also cleans.

The equipment is being leased by the Council. All results will be made available to industry. Reed said this automatic processing machinery is not manufactured in the U.S.

Florida

UNIVERSITY PLANTS 'ARTIFICIAL SEA GRASS'

Some 'artificial sea grass' was scheduled to be laid down along the Gulf bottom in July by Florida State University oceanographers. They are trying to provide a habitat for such valuable shellfish as scallops and shrimp.

Dr. R. W. Menzel, a biologist in the Oceanography Department, said that if the experimental plantings were successful they could show the way toward replacing the coast's natural habitats destroyed through dredging and filling. There, natural grass cannot be started again.

"But we don't know whether it will work," Menzel added. "Barnacles may attach themselves to the blades of grass and weight them down so that the grass doesn't wave like ordinary sea grass."

3 Areas

The ribbon-like, 18-inch long, strands of artificial grass have been attached to pieces of wire fencing. These will be put in 3 locations, each a 30-square-yard area.

One location will be in a dredged area along the channel leading from the marine lab harbor. Another will be in bare areas near where

natural grass is growing. A third will be on a bottom where no grass has grown before.

Productivity of the artificial grass areas will be compared with natural-grass-bottom productivity.

California

FEES VIRTUALLY PAY FOR FISH & WILDLIFE CONSERVATION

The California Department of Fish and Game reported on July 5 that Director Ray Arnett had told Gov. Reagan: "There are some 755,000 licensed hunters and 2,250,000 licensed fishermen in California, and that their license, tag and stamp purchases pay virtually the entire bill for fish and wildlife conservation activities in the State. The remainder of the funds come from fines for fish and game violations, commercial fish taxes and federal aid money from the federal excise takes on the sale of fishing tackle and sporting arms and ammunition. The Department of Fish and Game does not receive any General Fund money for its operations."

* * *

COMMERCIAL LANDINGS & TUNA SHIPMENTS DECLINED IN 1968

California's Department of Fish and Game has provided this report on State fisheries:

"California's commercial fish landings and tuna shipments totaled 567 million pounds in 1968, a decrease of 22 million pounds from the previous year. A 59 million pound decrease in the landings was partially compensated for by a 37 million pound increase in tuna shipments.

"Landings amounted to 445 million pounds, a decrease of 12 percent from 1967. The major factors in this decline were the drop in skipjack tuna landings and the absence of a substantial anchovy fishery early in the year.

"As in 1967, yellowfin and skipjack tuna were the first and second ranked species, together making up almost half of the catch. Jack mackerel was third ranked and anchovy fourth, reversing their 1967 order. Squid replaced Pacific bonito as the fifth ranked species. The next five species, in order of importance, were market crab, albacore, Pacific bonito, bluefin tuna, and rockfish. The top ten species made up 88 percent of the total landings.

"The most significant change in the landings was the drop of 51.7 million pounds in skipjack tuna landings, almost erasing the gain made in 1967. The anchovy catch declined by 38.6 million pounds, reflecting poor economic conditions for the reduction fishery early in the year. Other major decreases were a 6.3 million pound drop in Pacific bonito landings and a 2.8 million pound decrease in albacore. Bigeye tuna landings were down by 1.0 million pounds, reflecting a change in reporting procedures.

"The most important gain was made by jack mackerel; landings increased by 17.5 million pounds as fishing effort increased. Yellowfin tuna landings increased by 12.7 million pounds even though international controls limited the take. Squid landings jumped by 27 percent because of good market demand, and reached the highest level since 1946. Market crab landings were up by 4.3 million pounds, reflecting a record season in the Eureka area. Pacific mackerel landings rose by 2.0 million pounds to show a very slight recovery from the all time low recorded last year. Dover sole also showed a significant gain with landings increasing by 1.3 million pounds.

"Tuna shipments increased to 122 million pounds, a 43 percent increase from the low level recorded in 1967."

ARTICLES

FISHERY OCEANOGRAPHY

Felix Favorite

This is the first of a series by Dr. Favorite who, for over a decade, has been in charge of an oceanographic program to define the ocean environment of the Pacific salmon (genus Oncorhynchus). The purpose of the series is to show how oceanographic research can aid in locating areas of profitable fishing and in solving problems of fishery research.

The meteoric rise in popularity and funding of oceanographic research in the United States has caught most fishery biologists by surprise. Funds for biological studies have increased somewhat proportionately to those of other fields, but little effort has been made to influence oceanographers outside the agency concerned to conduct research directly related to fishery problems--except perhaps for the efforts of the Eastern Pacific Oceanic Conference. Nevertheless, in most national oceanographic programs, it is clearly stated that the research to be conducted will benefit the fisheries. Several years ago, while participating in a U.S.-USSR Oceanographic Exchange Program, I discovered that Soviet oceanographers also claimed that their research was beneficial to fisheries; however, fishery groups were somewhat skeptical about the extent to which it really aided their operations.

The Ocean Is Many Things

To the oceanographer, the ocean is a number of things: a three-dimensional, stratified fluid, on a rotating earth, subject to a variety of internal and external forces; a vast reservoir of heat which has a great influence upon the earth's weather and climate; a sink for excess CO_2 spewed into the air by modern industry and for dissolved and particulate fractions of the earth carried into the sea by river runoff; a medium for transportation of people and things, subject to destructive waves and storms; a reservoir of vast mineral wealth; and a highly complex biological environment.

The environment includes an intricate food cycle that starts with chemical nutrients and specific physical conditions and advances from microscopic unicellular plants to macroscopic herbivores (or plant-eating plankton) and then to carnivorous plankton (which is the prey of small and large fishes, and whales). Thus, fisheries are only a small portion of the spectrum of interest to the oceanographer. To the marine fishery biologist, also, oceanography is only one aspect of the total life history of fishes. But the oceanographer believes that all oceanographic research has some bearing on fishery research, even though specific relations are not sought by him; for his part, the fishery biologist often believes that it is too early to consider seriously the effects of the ocean environment until more research is accomplished in physiology, behavior, distribution, and mortality of fishes.

Fishery Oceanography

Man has always considered the environment to have an effect on fish. The use of surface temperatures on the Grand Banks is an excellent example that goes back several centuries. But it has been only during the last decade or two that a small group of dedicated people--known as fishery oceanographers--has tried to merge the fields of fisheries and oceanography. The term 'fishery oceanography' is purported to stem from 'fishery hydrography', which was coined at the beginning of this century. 'Fishery oceanography' is not only relatively new, but it is almost impossible to define--as witness the

Dr. Favorite is an Oceanographer with BCF Biological Laboratory, 2725 Montlake Boulevard East, Seattle, Washington 98102.

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variety of about 100 opinions obtained by Dr. W. M. Chapman[1] from leaders in marine science.

Perhaps the most-pertinent definition originates with Dr. O. E. Sette, Director of the BCF Ocean Research Laboratory and Chairman of the Eastern Pacific Oceanic Conference:

"Fishery oceanography is the study of living resources of the sea and of natural phenomena directly or indirectly influencing them in a manner potentially or actually significant to their use by man, including any information gathering needed for such studies."

This definition includes two aspects: the first is basically fishery biology; the second, the study of natural phenomena, is oceanography. It is expertise in this field that the oceanographer brings to fishery research to expand our understanding of the distribution, behavior, and abundance of fish. It is this phase of fishery oceanography that will be discussed in the series of articles.

More often than not, it is the physical oceanographer, rather than the biological or chemical oceanographer, who expands the horizon of the fishery biologist. This is because the biologist has already received extensive training in chemistry and biology. Someone has coined an apt phrase, fish-ical, rather than physical oceanographer. In some respects it is a good one. To be effective, this person must not confound his cohorts with rigorous hydrodynamical solutions--but bridge the gap between the two fields. Chemical and biological oceanography, however, are inextricably interwoven with the physical aspects; all must be considered in solving problems in fishery oceanography. For example, fish will not usually be in an area of ideal physical conditions if the water is polluted, or if there are no food organisms. Nevertheless, "fishery oceanographer" is not a particularly popular title because those that deviate from the pure-science aspects of their field are not looked upon favorably by their peers. This is perhaps particularly true in Japan, where a great deal of fishery oceanography is accomplished.

Progress Has Been Slow

Progress in fishery oceanography has been painfully slow. The fishery oceanographer is often forced to work without the extensive facilities that are available aboard a vessel designed exclusively for oceanographic research. Usually, he must share vessel time with the fishery biologist, who has a specific assignment to obtain a certain amount of data on fish catch regardless of the environmental conditions. The fishery oceanographer would like to change these circumstances. Unless one knows the environmental conditions under which the catch was made, the information does not contribute much to our knowledge of locations of profitable pelagic fishing. One might as well indicate the fishing location with an X on the water fished as on a chart, because it would be impossible to find that spot again. Of course, this shortcoming does not apply specifically to groundfish, because their distribution may be directly related to bottom topography. Nevertheless, most groundfish perform spawning and seasonal migrations that are probably triggered by environmental conditions; so the same statement can apply.

Progress will be slow as long as the fishery oceanographer is limited to taking observations along a predetermined or arbitrary fishing track, or only at fishing stations. It is important to know conditions in the general vicinity of the fishing location. Rather than striving for an equitable division of time aboard a single ship, it would be best to have two ships working together, one observing environmental conditions before and during fishing operations. Actually, both vessels should be capable of either phase of operation. I have not witnessed the routine used during Soviet fishing operations, but I was informed that areas of 80 by 120 miles were blocked out for fishery investigations. At times, 4 or 5 of the 10 vessels in an area of this size made extensive environmental observations during their fishing. This comparative effort could be considered fishery oceanography in the real sense of the term; the oceanographers involved in these studies are attached to the fishery institutes. The general large-scale oceanographic investigation that provides the background for selecting general fishing areas should continue. More effort, however, should be expended on small-scale investigations at the time of fishing.

The Pacific Salmon

If one is attempting to ascertain relations between fish and ocean conditions, perhaps

1/Comments on 'Fishery Oceanography,' Vols. I-III. Prepared for working party on Fishery Oceanography of Scientific Committee on Oceanic Research, International Council of Scientific Unions, 1962.

one of the most rewarding to study is the Pacific salmon. Like the Atlantic salmon (Salmo salar), the Pacific salmon are anadromous: they spawn in fresh water and, after a residence in fresh or brackish water (depending on species), they migrate downstream and far out into the ocean. There they grow and mature during a 1- to 3-year residence before returning to fresh water to complete the life cycle. But, unlike Atlantic salmon, Pacific salmon die after spawning. Only young salmon, or fry, make up the downstream migrants. It is not too difficult to obtain an estimate of the progeny from major river systems. Furthermore, it is fairly well documented that most will return to parent streams. Some stocks can be identified by chemical and biological techniques, as well as by tagging methods. Studies on the ocean environment of these salmon have been made at the BCF Biological Laboratory over the past decade in conjunction with exploratory fishing in the Pacific Ocean. Some results of these studies will be the subject of future articles.

WHAT CAUSES HURRICANES AND HOW DO THEY DIFFER FROM TYPHOONS?

Hurricanes are great heat engines, much like the gasoline engine in a car. The moisture in the humid air over the sea is analogous to the gasoline in the gas tank; it contains the potential energy (or fuel) for the hurricane. Once the hurricane is born, it draws moist air up from the sea surface in a counterclockwise spiral to the condensation level. Here cooling of the air, due to reduced pressure, condenses water vapor in the air. This can be equated to the combustion cycle in the gasoline engine; it converts potential energy to kinetic energy.

The latent heat of condensation (597 calories per gram of water) heats the air, which then accelerates in its upward spiralling journey. It literally goes "up the chimney" formed by the relatively cooler air around it. At the top of the chimney of cooler air, the warm air spreads outward in a clockwise spiral (when viewed from above). As air spirals upward, through and out of the chimney, it draws more warm, moist air into it from below. This self-perpetuating process intensifies the circulation, causing the engine to run faster and causes the hurricane to increase in size.

The exact mechanism of hurricane formation is still unknown. Scientists know that very warm ocean water is required. The warmer the water, the greater will be the volume of moisture (potential energy) carried aloft. A storm must be some distance away from the Equator in order to start spinning, because the spin of an object on the earth varies directly with the sine of the latitude. There must be an outward (divergent) flow of air in the high atmosphere; otherwise the chimney would be closed off.

The origin of a hurricane is associated with an area where air converges and showers occur. This may be a remnant of low pressure from a cold front which moved far south; it may be an area of lower pressure moving westward in the Trade Wind Belt (easterly wave); or it may be an area where air from the two hemispheres converges (intertropical convergence zone). The origin could be due to oscillation of the great high pressure system which dominates the ocean.

Hurricanes and typhoons are alike in origin, structure, and features, their only difference being the area of the world in which they occur. Hurricanes occur in the waters adjacent to North America (North Atlantic Ocean, Gulf of Mexico, Caribbean Sea, and Southeastern North Pacific Ocean); typhoons occur in the Western North Pacific Ocean. Because of the vast expanse of warm water in the Western Pacific, typhoons occur more often than hurricanes and are frequently larger and more intense. ("Questions About The Oceans," U.S. Naval Oceanographic Office.)

SEARCHING FOR TUNA

Thomas Potthoff

As part of the cooperation that exists between the Atlantic Oceanographic Laboratories of ESSA and the Tropical Atlantic Biological Laboratory of BCF (both in Miami, Fla.), I participated in the Atlantic Tradewind Expedition (ATEX) as an observer. The purpose of ATEX was to study oceanographic and atmospheric conditions in the central tropical Atlantic. This expedition was undertaken by three nations in February 1969: W. Germany furnished the two research vessels 'Planet' and 'Meteor'; Great Britain used the 'Hydra'; and the United States assigned the Coast and Geodetic Survey ship 'Discoverer'.

The four ships took up positions in the mid-tropical Atlantic at the beginning of February on the corners and at the center of a triangle, each side of which was about 350 miles long, and then drifted for $2\frac{1}{2}$ weeks, instead of occupying oceanographic stations along a planned cruise track.

Research at the Tropical Atlantic Biological Laboratory (TABL) centers on the biology of commercially important tunas in the tropical Atlantic Ocean. Research cruises over the past several years have produced large volumes of data from various sections of the tropical Atlantic, but biological investigations in the central tropical Atlantic--the area covered by ATEX--have been virtually nonexistent. TABL therefore welcomed the opportunity for one of its biologists to be present aboard the Discoverer during the expedition. Knowledge of the presence or absence of larval, juvenile, and adult tunas in the region could be important to an understanding of the life cycle of tunas and, conceivably, might help commercial fishermen in their quest for new fishing grounds. Collections made on ATEX of marine life other than tunas might also be valuable as indicators of the kinds of prey organisms that are available in the central Atlantic to large pelagic fishes, particularly the tunas. My objectives as an observer on the Discoverer were to collect small tunas and other organisms by dipnet under a night light, to collect larval tunas and other zooplankton by 1-meter net tows, and to observe and make records of schools of tuna and other large fishes.

On February 5, 1969, when the Discoverer occupied a position at 13° N. 39° W., a platform and an 800-watt light were rigged on the downwind side of the vessel. Part of each of the next 18 nights was spent dipnetting from the platform. Each midnight a plankton tow was made. The ship's rate of drift varied from 1.0 to 1.7 knots, which was slow enough to allow us to observe gradual changes in the composition of marine animals over a considerable distance.

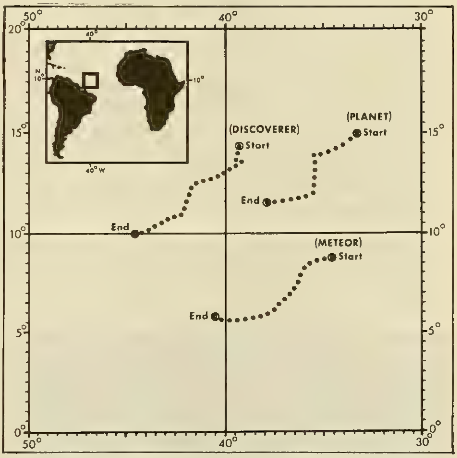

Fig. 1 - Drift tracks during the Atlantic Tradewind Expedition (ATEX), February 1969. The small square on the inset map (upper left) delineates the area shown in the figure. No trackline was available for the R/V Hydra.

During the first two nights, great numbers of the blanket octopus, Tremoctopus violaceus (rare in museum collections), were seen and caught. Fewer were netted during the third and fourth nights and, by the fifth night (at 12° N. 40° W.), they had completely disappeared. Specimens were up to $1\frac{1}{2}$ inches long; males of this size were adult, but females

The author is a biologist with BCF Tropical Atlantic Biological Laboratory, Miami, Florida 33149. Contribution No. 124.

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were juvenile. (Dr. Gilbert L. Voss, personal communication, Institute of Marine Sciences, University of Miami, reported that the adult female of the blanket octopus reaches a length of 3 to 5 feet.)

Fig. 2 - The R/V Discoverer on ATEX.

Flyingfish, Exocoetidae, became abundant on the second night and remained plentiful throughout the cruise; literally thousands of them thumped against the hull of the ship during some of the nightly observation periods. As we drifted SW, we encountered increasing numbers of young flyingfish until the vessel reached about 10° N. 43° W. From then on, the majority caught were very small--only 1 or 2 inches long. Adult dolphin Coryphaena spp., actively fed on the flyingfish.

Lanternfish, Myctophidae, were collected in moderate numbers every night. Almost as fast as they reached the surface, they were eaten by large squid and dolphin.

Fig. 3 - Night lighting. Dolphins feeding on organisms attracted to the light.

Small juvenile dolphin were caught around the light in good numbers but were apparently less abundant than the large adult ones. The numbers of adult dolphin milling about the ship increased each night until, at the end of the drift period, they were visible in a wide area all around the ship. We estimated at least one fish for every square yard of sea surface. In the daytime the dolphin scattered and few were observed. Many of the adult dolphin caught on fishing tackle by the crew averaged 5 to 10 pounds and some exceptionally large ones weighed 40 pounds. Sharks of 10 to 15 feet were seen often. Most were whitetip sharks, Carcharhinus longimanus, which were occasionally accompanied by rainbow runners, Elagatis bipinnulatus. Other species were caught under the light, but in smaller numbers than flyingfish, octopi, dolphin, and lanternfish. A number of squid were captured also. Several times the ship drifted into large patches of salps that luminesced when touched. Sometimes the area on the windward side of the ship was lit up by the salps as the vessel touched and drifted over them.

Fig. 4 - Sorting night's catch aboard R/V Discoverer.

On February 22, the drift period ended at 10° N. 44° W. The vessel had drifted about 360 nautical miles.

The biological observations made during the cruise in this poorly known mid-Atlantic area may be summed up as follows:

1. Not a single school of tuna was sighted and no juvenile tuna were collected, although the chances of finding tuna appeared favorable on the basis of the temperature (25-27° C.) and the presence of organisms suitable for tuna food.

2. Dolphin, the only large pelagic fish present in large concentrations, fed heavily on flyingfish. To my knowledge, this is the first report of concentrations of dolphin in the mid-Atlantic.

3. Study of the plankton tows made during this voyage (now in progress at TABL) has so far revealed the presence of a few skipjack tuna larvae. When all samples have finally been studied, better conclusions may be drawn as to the presence or absence of tunas in the tropical mid-Atlantic.

4. The many large concentrations of flyingfish, lanternfish, octopi, and salps observed, and the other organisms seen or collected, suggest an abundance of forage organisms suitable for tuna, marlin, and other large pelagic fishes.

WHAT UNIVERSITIES AND COLLEGES HAVE OCEANOGRAPHIC COURSES?

Before World War II, only two universities in the United States granted degrees in oceanography. By 1966, at least 50 colleges and universities were granting degrees in oceanography, marine biology, and ocean engineering; at least 20 others offered courses.

Because oceanographic facilities and ships are expensive, most institutions offer a broad training program covering the basic sciences, mathematical sciences, and some introductory environmental courses. Normally, the oceanographic curriculum is available to those who have completed the bachelor's degree. Specialization in marine biology and marine geology is available to undergraduates at some schools. In June 1966, the Sea Grant College Act, first suggested by Dean Athelstan Spilhaus, now President of the Franklin Institute in Philadelphia, and introduced into Congress by Senator Claiborne Pell (Rhode Island), was passed. This project to develop and support universities in much the same fashion as land grant colleges is being administered by the National Science Foundation.

A student interested in becoming an oceanographer should first major in one (or more) of the basic sciences--physics, biology, geology, chemistry, or meteorology. His later study of the ocean will relate to his past major. Most institutions offering degrees in oceanography require a bachelor's degree as a prerequisite. Oceanographers are expected to have mathematics through calculus.

Individuals planning to become oceanographers should begin preparation in high school; courses should include the sciences, mathematics, and a foreign language if possible. The best training for oceanography is to get into the "toughest" undergraduate science curriculum possible and to work hard.

Single copies of a list of colleges and universities offering degrees in oceanography may be obtained without cost from the National Oceanography Association, Suite 301, 1900 L Street, N.W., Washington, D. C. 20036. ("Questions About The Oceans," U.S. Naval Oceanographic Office.)

ECONOMIC EFFECTS OF REGULATIONS IN MARYLAND OYSTER FISHERY

Richard E. Suttor and Thomas D. Corrigan

Among the many species of shellfish harvested commercially in Maryland, the oyster is the most important by far. It accounts for over half the total value of the State's seafood landings. However, the oyster industry is not what it used to be.

Depletion and Repletion

In the late nineteenth century, Maryland oyster harvests exceeding 70 million pounds per year were recorded (Table 1). These large harvests were far greater than the maximum sustainable yield of the resource; the depletion of the oyster beds during this period signalled the long-term decline of the fishery. During the first quarter of the twentieth century, oyster landings decreased rapidly--but stabilized later with harvests usually ranging from 10 to 20 million pounds during the next 30 years. Annual landings declined during the late 1950s and early 1960s to an all-time low of less than 8 million pounds in 1963.

Table 1 - Maryland Oyster Catch, 1880-1966

Year	Catch	Year	Catch
	1,000 Lbs.		1,000 Lbs.
1880	71,868	1944	14,127
1888	57,845	1945	15,034
1890	70,852	1946	13,590
1891	67,428	1947	13,077
1897	49,189	1948	13,285
1901	38,548	1949	13,718
1904	29,333	1950	14,406
1908	39,527	1951	14,522
1912	37,273	1952	16,288
1920	30,832	1953	17,434
1925	28,822	1954	20,363
1929	17,185	1955	17,272
1930	17,106	1956	15,844
1931	16,374	1957	14,144
1932	12,985	1958	12,027
1933	11,685	1959	11,966
1934	13,917	1960	11,770
1935	15,584	1961	10,337
1936	16,060	1962	8,138
1937	20,730	1963	7,756
1938	19,363	1964	7,948
1939	20,342	1965	8,620
1940	19,743	1966	11,789
1941	18,816	1967 (est.)	16,730
1942	13,768	1968 (est.)	14,429

Source: U.S. Department of the Interior, "Fishery Statistics of the United States," Annual Statistical Digest, BCF, 1965 and 1966. Catch figures for 1967 and 1968 are BCF estimates.

To revitalize the industry, the State began an oyster repletion program in 1961. Oyster shells are dredged from nonproducing areas of the Chesapeake Bay and distributed on public oyster bars to provide "cultch" on which the oyster spat can attach and grow. The State also transplants seed oysters from nursery areas to growing areas, where the mature oysters are later harvested. In recent years, over one million bushels have been transplanted annually (table 2). As a consequence, the industry has recovered somewhat during the past few years; the 1967 harvest was over 16 million pounds, nearly double the 1965 landings. Maryland has now regained its position as the leading oyster-producing state.

Table 2 - Oyster Seed Production, Maryland Oyster Propagation Program, 1961-1967

Year		Seed Production
		1,000 Maryland Bushels
1961	. . . .	237
1962	. . . .	573
1963	. . . .	932
1964	. . . .	1,191
1965	. . . .	1,192
1966	. . . .	1,364
1967	. . . .	1,278

Source: "Seed Oyster and Shell Plantings," Annual Reports, The Natural Resources Management Division, Department of Chesapeake Bay Affairs, Annapolis, Maryland, 1961-1967.

Mr. Suttor is Associate Professor and Mr. Corrigan is Faculty Research Assistant, Department of Agricultural Economics, University of Maryland.

Note: This research was supported in part by BCF and Maryland Department of Chesapeake Bay Affairs under Commercial Fisheries Research and Development Act, Project Number 3-42-D. Members of BCF's Division of Economic Research assisted throughout research project and review of article.

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Fishery Regulations

Over the years, a complex system of State and county laws evolved in response to the decline of the oyster fishery. Although these laws protected the resource from even greater depletion, some restrictions militated against economic efficiency.

There are good reasons for regulating fisheries, both from the conservation and the economic point of view. Conservationists wish to maintain the productivity of the resource. However, increasing demand for commercially valuable seafoods forces up the price, thereby drawing more labor and capital into the fishery. Since the increasing fishing effort will, at some point, permanently damage the resource, conservationists argue for regulations designed to forestall its depletion.

Economists argue for regulation on the basis of efficient resource allocation; that is, labor and capital should be allocated among industries in such a way that the total output of the economy is as large as possible. Unfortunately, when the fishing grounds are not privately owned, too much labor and capital enter the fishery[1/]. Consequently, economists believe that regulations should be devised with a view toward limiting the quantities of labor and capital employed in the fishery.

Regulations[2/] employed in the Maryland oyster fishery include: Closed fishing areas and closed seasons, limitations on technology, tax measures, and private leasing of oyster beds.

Closed Seasons and Closed Areas

The season for tonging, the most common method of harvesting oysters in Maryland, extends from the middle of September to the end of March. The season for dredging is slightly shorter; it begins the first of November and closes the middle of March. The State also closes certain oyster-producing areas when deemed necessary to protect against overfishing.

A closed season causes specialized equipment to be idle during part of the year. It also causes a concentration of fishing effort at the beginning of the season. However, the resulting inefficiencies are relatively unimportant in the Maryland oyster industry. This is because investments in specialized fishing gear are small, and most oystermen work either in other fisheries or on nonfishing jobs when not oystering.

Closed areas cause some fishermen to travel further between home port and oyster beds. However, some beds must be closed to improve their productive capacity in future seasons. Thus, the long-term benefits are greater than the immediate costs.

Limitations on Technology

The limitations on technology in the Maryland oyster fishery are both well known and widely criticized. The complete prohibition on dredging public grounds with mechanical power was recently relaxed to allow power dredging 2 days per week. Only dredging by sail boats is allowed on other days. The impack of this limitation is illustrated by comparing harvesting techniques in the 2 Chesapeake Bay States. In Virginia, where power dredging is lawful 6 days a week, 48 percent of the oysters was harvested by dredges in 1966. In contrast, only 23 percent of the Maryland catch was harvested by dredges.[3/]

There are at least 2 objections to limitations on technology. First, the enforced inefficiency increases the cost of harvesting a given quantity. Second, the artificially high prices resulting from exclusion of the most efficient harvesting techniques induce too much labor or capital, or both, into the industry. Also, in a long-run context, it may be argued that current limitations on technology discourage innovation. A potential innovator may, with some justification, expect the passage of a new regulation outlawing any new efficient gear that he may develop. This would explain why the harvesting methods in the Maryland oyster industry are virtually the same as the methods of the nineteenth century.

Tax Measures

Taxes are taking on an increasingly important role in regulating the Maryland oys-

1/ The economic theory underlying this statement is discussed in the Crutchfield and Zellner reference.
2/ A detailed discussion of fishery regulations can be found in the Scott reference.
3/ "Fishery Statistics of the United States, 1966."

ter industry. The 1968 session of the State legislature raised the tax on locally produced oysters from 2 cents to 25 cents per bushel [4/]. Also, it increased the tax on oysters shipped out of the State in the shell from 2 cents to 10 cents.

A simulation model of the Maryland oyster industry was used by the authors to evaluate the economic impact of various tax rates. The simulation results (Table 3) include the projected 1975 price, fishing effort, oystermen's income, and tax revenue under three alternative tax rates: 0.31 cent per pound (2 cents per bushel), 3.88 cents per pound (25 cents per bushel), and 5.88 cents per pound.

Table 3 - Projections of Maryland Oyster Industry Under Alternative Tax Levels, 1975

Tax rate (cents per pound) . .	0.31	3.88	5.88
Price (cents per pound)	91.4	87.7	85.7
Effort (men)1/	4,012	3,919	3,866
Net income per man (dollars) . .	2,567	2,526	2,502
Tax revenue (thousand dollars)	42	526	797

Source: The projections were obtained from a simulation model of Maryland oyster industry. The model will be presented in a forthcoming University of Maryland Agricultural Experiment Station bulletin.
1/Effort is defined as number of full-time equivalent oystermen.

An increase in the tax rate causes a decline in the exvessel price and a fall in oystermen's net incomes. So, there is a decline in fishing effort as some oystermen leave the industry or cut down the number of days fished.

The higher tax rates coupled with only minor changes in landings results in substantial increases in tax revenues. By setting an appropriate tax rate, the State can collect enough revenue to pay for the oyster repletion program.

Private Leasing

If the oyster beds were controlled by individuals, there would be no need for legal restrictions limiting fishing effort. Long-term leases on oyster beds enable the fisherman to cultivate the beds just as a farmer cultivates his land. If there were a large number of competing firms, as in U.S. agriculture, private leasing would promote efficient use of labor and capital inputs. In addition, the resource would be conserved because the renter would have the same incentive for conserving his oyster bed as the farmer his land.

Table 4 - Total and Private Catch in Leading Eastern Oyster Producing States, 1966

State	Total Catch	Private Catch	Percent Private
	. . . . (1,000 Lbs.)		Percent
Maryland . .	11,789	1,437	12
Virginia . . .	9,443	4,639	49
Louisiana . . .	4,764	3,741	79
Texas	4,725	199	4
Florida	4,292	238	6
South Carolina	2,615	2,615	100
Mississippi . .	2,232	0	0

Source: "Fishery Statistics of the United States, 1966."

Private leasing is common in many states (Table 4). About 79 percent of the 1966 Louisiana oyster production and 49 percent of the Virginia production were harvested from private beds. On the other hand, only 12 percent of the 1966 Maryland production and 4 percent of the Texas production were landed from private grounds. The argument against extensive private leasing is a noneconomic one; namely, that residents of a state should have free access to publicly owned natural resources. Thus, the private ownership question is a question of value judgments, which must be decided in the political arena.

As the above percentages indicate, Maryland has attempted to steer a middle course by leasing some Chesapeake Bay bottom while leaving most acreage open to public fishing. Certain areas may be leased if the area does not contain a natural oyster or clam bar--or if the area produced no marketable oysters in the last 5 years prior to application. As a consequence of these rather severe restrictions, a relatively small acreage has been leased.

Conclusions

The many regulations applied to the Maryland oyster industry all tend to reduce pressure on the fishery resource, thereby contributing to the conservation goal. On the other hand, some regulations, particularly limits on technology, hinder the efficient use of labor and capital. However, there is some tendency to move in the direction of regulations conformable with economic efficiency. Notable changes are the partial relaxation of the prohibition on power dredging and the increased tax on oyster landings.

4/ A Maryland bushel contains 6.3 pounds of oyster meats and usually returns between $4 and $5 to the oysterman.

In the absence of a large increase in private leasing, which is unlikely, restrictions will be required to protect the fishery resource. As a result, there will probably be no radical changes in the foreseeable future in regulations pertaining to closed seasons, closed areas, and fishing gear.

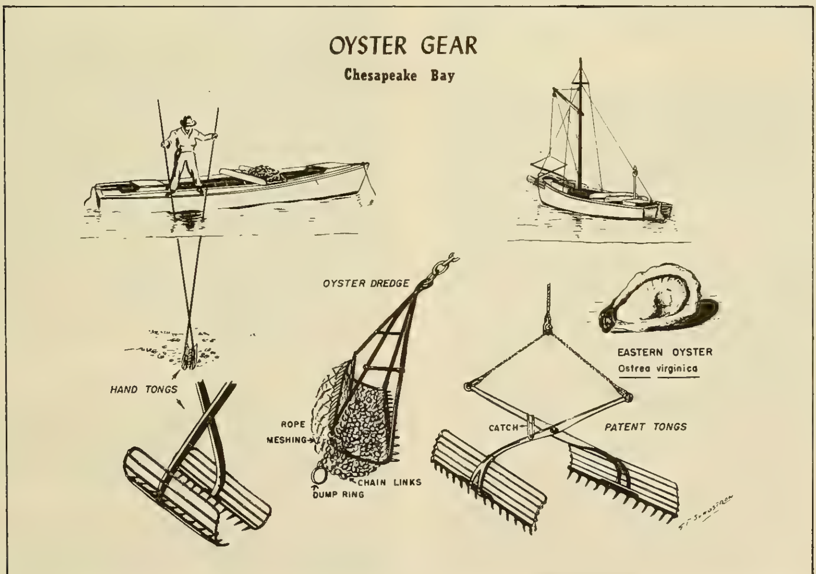
References

CRUTCHFIELD, JAMES and ARNOLD ZELLNER
1962. "Economic Aspects of the Pacific Halibut Fishery," Fishery Industrial Research, Vol. 1, No. 1, United States Department of the Interior, BCF, April.

SCOTT, ANTHONY
1962. "The Economics of Regulating Fisheries," in Economic Effects of Fishery Regulations, R. Hamlish, ed., Food and Agriculture Organization of the United Nations.

SUTTOR, RICHARD E., THOMAS D. CORRIGAN, and ROBERT H. WUHRMAN
1968. The Commercial Fishing and Seafood Processing Industries of the Chesapeake Bay Area, Maryland Agricultural Experiment Station, Miscellaneous Publication No. 676, November.

U.S. DEPARTMENT OF THE INTERIOR
1966. Fishery Statistics of the United States, Annual Statistical Digest, BCF.



FISH CULTURE

"Directory of Fish Culture Institutions," FAO Fisheries Technical Paper No. 85, Food and Agriculture Organization of the United Nations, Rome, Italy.

This is a directory of private and governmental institutions engaged in fish culture research in 41 countries, including East and West Germany, Hungary, Israel, Japan, Poland, Netherlands, Taiwan, USSR, and U.S. Prepared by FAO's Department of Fisheries, it lists the location of the institutions, number of scientists employed, physical facilities, research programs, training facilities, and publications.

MACKEREL

"The Spanish Mackerel and King Mackerel Fisheries," by Charles H. Lyles, C.F.S. No. 4936, Department of the Interior, Fish & Wildlife Service, April 1969, 21 pp., illus. Available free from Branch of Reports, BCF, 1801 N. Moore St., Arlington, Va. 22209.

An oily, delicately flavored fish, the Spanish mackerel supports a commercial fishery that lands a yearly average of 8 million pounds worth about three-quarters of a million dollars. Landings fluctuate considerably, apparently influenced more by the market than by abundance. Full development of the fishery has been hindered by an inability to preserve the delicate, fresh flavor until the fish reaches the consumer.

Lyles reviews the history of the fishery since 1880, provides statistics, and gives several recipes. He emphasizes the urgent need to attack the problem of long-term preservation, a problem that must be solved in order to exploit this enormous, underutilized resource.

OCEANOGRAPHERS

"The New World of the Oceans: Men and Oceanography," by Daniel Behrman, Little, Brown and Co., Boston, 1969, 436 pp., illus. $8.95.

The mass media--newspapers, magazines, television, and radio--expend an enormous amount of time and effort telling us of the lives and works of men dedicated to outer space. But where can we go to learn of the lives and works of men dedicated to the study of inner space--the oceans? We can go to this book--an engaging, well-researched, and highly informative account of oceanographers and their science.

Claiming no special knowledge, Daniel Behrman is an ideal reporter. The reader learns along with him, and comes to share his infectious enthusiasm for his subject.

He decided early in his research that the most interesting forms of life in the sea were the men studying it. From Scripps Institution to Woods Hole, he met an unexpected force of biologists and economists, geologists and lawyers, fishermen and physicists. The variety of their research projects is astounding. Behrman, discovering the multifaceted world of oceanography, makes it both interesting and intelligible to the layman.

OCEANOGRAPHY

"Films on Oceanography," by R.P. Cuzon de Rest, National Oceanographic Data Center, 1969, 99 pp., $1. For sale by Superintendent of Documents, U.S. Government Printing Office, Washington, D. C. 20402.

This is a catalogue of 155 films on all aspects of oceanography--biology, chemistry, engineering, geology, and physics. It includes

a brief description of each film--and data on size, color, sound, running time, appropriate audience, sources, and cost. Many can be borrowed.

SALMON CONSERVATION

"The Pacific Salmon Fisheries: A Study of Irrational Conservation," by James A. Crutchfield and Giulio Pontecorvo, Johns Hopkins Press, 1969, 220 + xii pp., $6.

As one of the most valuable North American fisheries, the Pacific salmon has an important economic influence. Beyond this importance, however, the industry itself is a good example of the general issues involved in fisheries management--biological yield, conservation, economics, the labor force, and industrial organization. The industry has suffered a chronic economic distress that can be attributed, only in part, to a decline in quantity of output.

James Crutchfield and Giulio Pontecorvo are economists. They have traced the history and analyzed the results of public management programs, particularly as applied to commercial fishing in Alaska and Puget Sound. They point out that public management has failed for the most part because the problems have been treated as strictly biological rather than economic. They offer an alternative program of public regulation based on both biologic and economic criteria. "Productive fish stocks are a necessary, but not a sufficient, condition of optimal use of those stocks," they say. The book makes a compelling case for a stronger economic approach to fishery management and conservation.

The authors also discuss fishing gear, geographic expansion of the fishery, the political environment, and biological constraints.

SALMON COMMISSION

"Annual Report 1968," International Pacific Salmon Fisheries Commission, New Westminister, Canada, 1969, 37 pp., illus.

This report includes a review of the Fraser River pink and sockeye salmon fisheries, their history, and the activities of the Commission during 1968. It includes the Commission's plans to restore and increase the value of the fisheries by raising the population beyond its original level.

SALMON IN ALASKA

"Alaska's Fishery Resources: The Pink Salmon," by Jack E. Bailey, Fishery Leaflet 619, Department of the Interior, Fish & Wildlife Service, 1969, 8 pp., illus. Available free from Division of Publications, BCF, 1801 N. Moore St., Arlington, Va. 22209.

Salmon fishing is the largest commodity industry in Alaska, and pink salmon is the most valuable species. The pink salmon, also called 'humpback,' is the most abundant Pacific salmon in Alaska. Its production has an average wholesale value of $28 million and it constitutes more than half the total salmon catch.

Bailey describes the fish, its distribution, abundance, and natural history, and discusses fishery management.

SALMON MIGRATION

"Final Report on Migrant Salmon Light Guiding Studies at Columbia River Dams," by Paul E. Fields, North Pacific Corps of Engineers, Portland, Oregon, 1966, 266 + xvii, pp., illus.

Numerous dams have made nearly all of the Columbia River from tidewater to the Canadian border a series of pools. There are facilities to assist adult salmon migrating upstream at all but 2 of these dams, but facilities for young downstream migrants are limited.

The mortality percentages of fingerling and yearling salmonids demand that some method be found to guide them around the dangerous areas in relatively small amounts of water. When this study was initiated, the only generally accepted method of guidance was a mechanical screen. This is not practical in large rivers. The study showed that light is an effective guiding stimulus, both under laboratory conditions and in field-validation experiments.

SALT FISH

"Improved Method for Producing Pindang," by Sofjan Iljas and Louis J. Ronsivalli, "Fishery Industrial Research," pp. 11-16, Department of the Interior, Fish & Wildlife Service, 1969.

Boiled salt fish, 'pindang,' is a popular food in Indonesia and Southeast Asia. It is known as 'sinaeng' in the Philippines and 'platunung' in Thailand. To produce pindang, alternate layers of eviscerated fish and salt are placed on a rack and held above boiling water in earthenware or tin containers. The containers are covered and the fish steamed for about 8 hours. Pindang can be held for 1 to 12 weeks depending on the concentration of salt.

This paper describes an improved method of production using plastic pouches. With this method, the fish can be stored at room temperature for up to 3 months. The pouches eliminate sanitation problems, double the rate of production, and minimize losses during storage.

SPINY LOBSTER

"The New Zealand Rock Lobster or Marine Spiny Crayfish, *Jasus edwardsii* (Hutton)--Distribution, Growth, Embryology and Development," by J. H. Sorenson, Fisheries Technical Report No. 29, New Zealand Marine Department, Wellington, 1969, 46 pp., illus.

Crayfish, or rock lobster, has become the most valuable single species in New Zealand's fishing industry. This is due mostly to a strong demand for frozen tails in the U.S. After reaching a peak in 1956, landings declined in volume and in size of individual fish. Later, huge unfished stocks were discovered off Chatham Islands, and a new record of 159,102 cwt., worth NZ$4,319,908, was reached in 1967.

A fishery of this magnitude and value must be wisely managed to achieve a balance between natural increase and exploitation. The protection of females carrying external eggs is essential. This report describes and illustrates a technique to determine whether unlawful egg-removal has taken place. It includes the life history and biology of the species, and discusses initial steps taken towards laboratory rearing and 'farming.'

"The New Zealand Crayfish, *Jasus edwardsii* (Hutton)," by R. J. Street, Fisheries Technical Report No. 30, New Zealand Marine Department, Dunedin, 1969, 53 pp., illus.

This is an account of the growth, moulting cycle, movements, reproduction, and predators of the New Zealand crayfish.

TECHNOLOGY

"The Automation of Fish Processing and Handling - A Bibliography," by Garland L. Standrod, Department of the Interior, 1969, 37 pp. Available from Clearinghouse, Springfield, Va. 22151.

This is a selected list of 312 reports and articles, some in foreign languages, covering all aspects of automated fish processing and handling.

U.S. FISHERIES

"Fisheries of the United States. . . 1968," by Charles H. Lyles, C.F.S. No. 5000, Department of the Interior, Fish & Wildlife Service, March 1969, 83 + xx pp. Available from Division of Publications, BCF, 1801 N. Moore St., Arlington, Va. 22209.

A complete review and analysis of U.S. catch, landings and value, imports and exports, production and supplies, by species, region, and type of product. It includes sections on prices, per capita consumption, and numerous statistics.

--Barbara Lundy

INTERNATIONAL

Super-Seiners Slated for West African Waters

The 'Biscaya,' a 1,082-ton French-flag tuna purse seiner left Bayonne recently for West African waters. Her departure heralded a new phase in European eastern Atlantic tuna fishing. The U.S.-designed tuna seiner, the largest ever built in Europe, is the forerunner of a new fleet of super seiners for the French, Spanish, and Italian fleets.

Previously, only a few purse seiners had sought tuna off West Africa. This has been attributed to insufficient knowledge of the grounds and waters of the Gulf of Guinea, and of fishing with the purse seine.

American Influence

But in 1968, the Americans came with their huge modern purse seiners and their helicopters. Their success and obvious efficiency had a tremendous effect. In fact, their success in the Pacific was already being closely scrutinized by European and African fishing interests eager to exploit West African tuna resources.

Japanese Plans

One Japanese owner had sent a new 250-ton-hold capacity tuna purse seiner to operate off West Africa in 1968. He is to replace it this year with one of 1,000-ton-hold capacity, such is the increased overall efficiency of the larger vessels.

Other Countries

Italian interests are planning one or more 1,000-ton-capacity purse seiners as are owners in Spain. One Spanish owner is reported to be studying conversion of the revolutionary suction purse seiner 'Sarasua' into a U.S.-style vessel.

French Operations

The French, who have had perhaps the strongest tuna fleet off West Africa, also have been watching developments with these large super-seiners.

In 1968, there were 35 French tuna freezers, 17 purse seiners, and 18 bait boats in the area. They increased production by 50% over the previous year, due to the conversion of many bait boats into purse seiners. Now, this freezer fleet is to be greatly expanded. France hopes to play a larger role in the production of tuna for both the EC and the international market. They have chosen the most efficient type of vessel available in order to compete on an equal basis.

Characteristics of Biscaya

The all-welded steel-hull Biscaya is 53.95 m. (177 ft.) long overall, 50 m. (164 ft.) bp., and moulded breadth is 10.87 m. (36 ft.). Depth to main deck is 5.89 m. (19 ft.), and draft aft 6.40 m. (21 ft.). She has a two continuous deck construction, the engineroom is forward and all accommodation is in the deckhouse superstructure.

Although fitted with as much European equipment as possible, she still has a good deal of American machinery aboard, notably the fishing gear. ('Fishing News International,' May.)

Atlantic Albacore Fishery Developments

In early June, about 15 Japanese longliners were fishing albacore tuna in the Atlantic off Angola and South Africa. They were catching a daily average of 2.5-3 tons per vessel. This is considered normal for the season, but is somewhat below the same period last year when many small albacore were taken. About 50 Taiwanese and 25 South Korean tuna vessels also were reported fishing albacore in the region.

Prices

In early June, c. & f. prices for frozen round albacore exports to Puerto Rico were around US$510 a short ton for 40-pound fish and $480 for smaller sizes taken off Angola. Export prices for frozen round albacore deliveries to California were about c. & f. $544

Export prices for frozen round albacore deliveries to California were about c. & f. $544 a ton for 30-pound fish. ('Suisan Tsushin,' June 5.)

FAO & USSR Sponsor Caribbean Fishery Study Tour

Fishery scientists from Latin America took part in a study tour aboard a Soviet oceanographic vessel in the Caribbean Sea June 22 to July 25. The group fellowship study tour was sponsored jointly by the USSR and the United Nations Development Program. The USSR, though not a member of FAO, contributes to UNDP.

Fishery Lectures

Some 20 fishery biologists and oceanographers from various Latin American countries, including Brazil, Costa Rica, Cuba, Mexico and Uruguay, were aboard the 3,730-ton research vessel 'Akademik Knipovich'. They heard lectures on modern methods of fishery and marine research, and received instruction in the use of acoustical equipment and other fishing and navigational aids.

They also were scheduled to visit marine and scientific institutions in Belem, Brazil--starting point of the tour--Havana, Cuba, and Vera Cruz, Mexico, where the tour ends.

The Akademik Knipovich carried out exploratory fishing and marine biological research en route. The findings will be published by interested governments.

Third Tour

The tour is the third of its kind. Previous tours were held aboard the Knipovich in the southern Mediterranean Sea last year, and in the Black Sea in 1967. Participants in these tours came from African, Asian and East European countries.

Japan and Mauritania Reopen Negotiations

Japan and Mauritania were scheduled to reopen fishery negotiations at Nouakchott on June 10. This will be the two countries' third attempt to agree on allowing Japanese trawlers to operate in Mauritania's 12-mile exclusive fishery zone.

The first talks were held in Tokyo in fall 1968. The basic understanding was that Japan would pay Mauritania US$277,800 entry fees for 69 trawlers planning to catch 10,000 metric tons of octopus. Talks at Port Etienne in Dec. 1968 were broken off because Mauritania requested fishery assistance over and above that offered by Japan.

The latest negotiations may settle the problem. The 8-man Japanese negotiating team will include 2 government officials. ('Suisan Tsushin,' May 14.)

Japanese Longliners Asked Not to Fish Off New Zealand

The New Zealand Government reportedly has sent a request to the Japanese Foreign Office asking that Japanese tuna long liners fishing off her shores move into other areas. Close to 100 long liners were fishing for southern bluefin off New Zealand. Many of them had shifted from southeast Australia where the southern bluefin resource has declined. Since they operate beyond New Zealand's 12-mile fishing limit there is no legal problem. However, the presence of a large number of Japanese vessels is causing some concern. ('Suisancho Nippo,' May 27.)

Soviet Whaling Flotilla Calls at Las Palmas

Returning from the Antarctic, one of the 3 Soviet whaling factoryships, 'Iurii Dolgorukii', called for 4 days at Las Palmas, Canary Islands. She was accompanied by 15 catcher boats and a support vessel. The whaling flotilla was on its way to home port at Kaliningrad. During past years, the Iurii Dolgorukii

flotilla usually stopped at Montevideo, Uruguay. The vessel arrived at Kaliningrad on May 19.

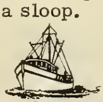
The Soviets have been using Las Palmas more and more since the closure of the Suez Canal. The exact number of Soviet fishing vessels calling at Las Palmas is unknown, but it may approach 100 during 1969.

Another Soviet whaling factoryship, the 'Sovetskaia Ukraina', accompanied by 20 catcher boats, called at Ceuta, a Spanish port in northern Morocco, on her way to the fleet's home port of Odessa.

Research Vessel Visits Cape Town

The 'Bakhchisarai,' research vessel of the Atlantic Research Institute of Fisheries and Oceanography (ATLANTNIRO), called at Cape Town, South Africa in early May. The vessel was visited by scientists of the Fisheries and Oceanography Department of Cape Town University. The South Africans said afterwards that their research vessel, the 'Thomas B. Dave,' compares to the Bakhchisarai "like a jalopy compares to a Rolls Royce."

Before leaving Cape Town on May 9, the Soviet scientists and crew toured the city and visited fishery research facilities. Despite the exuberant South African appraisal of the Soviet research vessel, some of her crew members found Cape Town more attractive: they missed the vessel's departure and had to be taken to her in a sloop.



Adriatic Fisheries Agreement Signed

Italy & Yugoslavia have signed a 3-year Adriatic fisheries agreement replacing one that expired in December 1968. Under the old agreement, the Italians had obtained 195 permits to fish their historic grounds on the Yugoslav side of the Adriatic. Under the new agreement the permits will be reduced to 165 in 1969, and 140 in 1971. In addition, the Yugoslavs have limited Italian fishing to vessels not exceeding 80 gross tons with 220 hp. engines. ('La Pesca Italiana,' May 1.)

The Italian Fisheries Association, pointing out that the agreement was the best the Italian delegation could reach, noted that it was not happy with the decrease in fishing permits. It believes Yugoslavia intends to push Italian fishing in Yugoslav waters towards the south Adriatic where resources are less abundant. The Association, recognizing that there is little that can be done to reverse this trend, called on the Italian Government to adopt a policy of "large vision"--a policy that would permit Italians to begin fishing in "more "distant" grounds.

Southeast Asia Fisheries Development Center Operations

The Research Department of the Southeast Asia Fisheries Development Center is scheduled to start functioning by September 1969. Research vessels, contributed by Japan, were to be available for trial runs in July, and fully operational before the end of 1969. A Training Department building is to be started in the summer of 1969 and completed by mid-1970. Crew training will begin in late 1970. The Research Department buildings at Changi are almost complete, and equipment will be installed soon.

U.S. Aid Grant

It has been requested that funds from the projected U.S. contribution of US$100,000 be made available without restrictions on buying fuel and insurance for research vessels. This would enable the Research Department to begin the first year's operations. U.S. AID grant had limited funding to items only of U.S. origin. The grant was not to cover vessel fuel and insurance costs. However, AID has approved lifting the restriction. (U.S. Embassy, Bangkok, Apr. 4 & 14.)

FOREIGN

CANADA

NEW TERRITORIAL SEA AND FISHING LIMIT BASELINES DRAWN

New Canadian baselines delineating territorial sea and fishing limits along the east coast of Nova Scotia and the west coasts of Vancouver Island and Queen Charlotte Islands have been announced. Regulations took effect on June 11.

Existing treaty rights and traditional fishing activities will be recognized, pending conclusion of negotiations with the U.K., Norway, Denmark, France, Portugal, Spain, Italy, and the U.S. (U.S. Embassy, Ottawa, June 4.)

* * *

FIRST-QUARTER LANDINGS IN MARITIME PROVINCES WERE AT 1968 LEVEL

Landings in the Canadian Maritime Provinces Jan.-Apr. 1969 were 205 million pounds worth $13.7 million exvessel. In the 1968 period, 205 million pounds worth $12.3 million were landed; in 1967, 141 million pounds valued at $10.3 million.

April 1969

During April 1969, total fish landings in the Maritime Provinces (N.S., N.B., P.E.I.) were 54.1 million pounds worth C$5.3 million exvessel. The April landings included 34.1 million pounds of groundfish, $2.3 million; 15.7 million pounds of pelagic and estuarial species, $195,000; and 4.3 million pounds of shellfish, $2.8 million.

The quantity and value of April 1969 fish landings were below April 1968. The April 1969 catch was 4.3 million pounds below the 3-year (1966-1968) average, but value was $547,000 above the 1966-1968 average.

Fishery Ups & Downs

During April, landings of cod, redfish or ocean perch, halibut, and flatfish were below the 1966-1968 average. Landings of haddock, herring, and lobster were above. Scallop landings were the same.

Landings by trawlers and draggers over 70 feet long totaled 29.1 million pounds--81.8% of groundfish landings and 93.6% of scallop landings. (Canadian Dept. of Fisheries and Forestry, May 27.)

* * *

FISHERIES MINISTER WARNS OF OVERFISHING QUEEN CRAB STOCKS

Overfishing queen crab stocks off Canada's Atlantic coast is a possibility, warned Jack Davis, Canadian Fisheries Minister, at a recent meeting in Fredericton, N.B. Despite a tenfold increase in production since the early 1960s, little is known about the resource. Moreover, a threat exists from unlimited entry of Canadian companies into the fishery. Davis called for serious consideration of limitation of entry into the queen crab fishery. ('Fisheries of Canada,' Apr.)

* * *

GOVERNMENT BUYS FROZEN GROUNDFISH

Contract awards by the Fisheries Prices Support Board to buy slightly over one million pounds of frozen groundfish products were announced May 14 by Fisheries and Forestry Minister Jack Davis. The purchases are being made under the Board's program of assistance to the industry announced April 24. The program objective is to prevent distress sales by producers and to stabilize market. First tenders were opened on May 12. Further tenders will be opened every 2 weeks for duration of program.

Program's Goal

The Board's initial awards are being made within a price range of 23.75 to 24.50 cents a pound for frozen-cod blocks. Davis said he was pleased with improvement in the market since the Government first announced in February its decision to intervene. Since then, the price for cod blocks, delivered Boston, has risen from 21 to 24 cents a pound. The program's goal is to raise depressed market prices to a level comparable with costs of efficient producers. Davis said

Canada (Contd.):

additional purchases will be made until objective is reached. (Canadian Dept. of Fisheries and Forestry, May 14.)

* * *

SALT FISH ADVISORY COMMITTEE FORMED

Formation of a Salt Fish Advisory Committee has been announced by Canada's Fisheries and Forestry Minister, Jack Davis. The Committee consists of 8 members of the Atlantic Coast industry. It will advise the Minister on current problems and on the effects of government assistance programs. A deficiency payment program for the current year was announced on April 25. The Minister said that reorganization of the industry will begin next year. (Fisheries Information Service, June 4.)

* * *

INVESTIGATES DISCOLORED NEWFOUNDLAND HERRING

The occurrence of discolored or red herring in limited areas in Placentia Bay and St. Mary's Bay in Newfoundland has been studied by the Canadian Department of Fisheries and Forestry since early Feb. 1969, when they were first noticed. The occurrence close to a new phosphorous plant raised the possibility that the fish deaths were caused by the plant's effluent. However, there is no proof of this.

Investigation Intensified

The Department's investigation is being intensified, and the Federal Department of Health and Welfare has been asked to study the dead fish. As added precaution, fishing in Placentia and St. Mary's Bays is being watched constantly. No fishing boats are active there. No fish that could possibly have been contaminated by effluent from the phosphorous plant is being processed for sale. (Canadian Dept. of Fisheries and Forestry, May 1.)

* * *

CONFERENCE ON FISH INSPECTION AND QUALITY CONTROL

Fishery experts from almost 40 countries met in Halifax, Canada, July 15-25, to discuss how to promote and improve inspection services to assure high quality standards for fish and fish products. The experts were attending the first Technical Conference on Fish Inspection and Quality Control. More than 200 fish inspectors, technologists, biologists, administrators and other specialists representing government, industry and private institutions participated.

The conference discussed the organizational aspects of fish inspection, principles of quality control and new, improved methods of determining quality and preserving freshness and edibility. They also reviewed standards and techniques used in different countries of the world.

The need for improving and enforcing inspection services was emphasized in a paper prepared by FAO. In developing countries, especially in the tropics, the paper stated, inspection systems can help to develop modern fishing industries and make a country's products more acceptable in international markets.

Papers were presented on subjects ranging from consumer evaluation of fresh and frozen fish, ultrasonic inspection of parasitized whole fish, and the training of fishery inspectors, to theoretical and practical considerations in the development of grade standards for fishery products.

The significance of the meeting was emphasized by Roy I. Jackson, FAO Assistant Director-General for Fisheries, who said it was "a major first step towards establishing national and international standards for fish inspection and quality control; the need for which is becoming more and more apparent". (FAO News Release, June 30.)

EUROPE

USSR

MAY JOIN INTERNATIONAL MARITIME COMMITTEE

Soviet jurists interested in maritime law created the Soviet Maritime Law Association in 1968. Its president, Andrei Zhudro, has stated that the Association would seek to join the International Maritime Committee, which was scheduled to meet at Tokyo in April 1969. The USSR is party to almost all major conventions and agreements governing navigation and other marine activities. One is the Inter-Governmental Maritime Consultative Organization, which governs the conduct of maritime trade. (TASS, Mar. 11.)

The Soviet Union's fishing fleet is the largest and most modern in the world. Her merchant marine is sixth among maritime nations.

* * *

COOPERATES IN INTERNATIONAL BALTIC SEA RESEARCH

The Soviet research vessel 'Mazirbe' left Riga on May 9 to begin a new phase in unified international research of Baltic. Six countries are participating: Finland, USSR, Sweden, East Germany, Poland, and West Germany.

Systematic international investigation of the Baltic began in 1964. A synoptic-hydrological survey made at that time has helped oceanographers devise methods for calculating the temperature fields of sea waters and currents. These calculations are essential for navigators of merchant and fishing vessels.

Ten permanent hydrological stations have been set up to observe water temperature, currents, salinity, chemical composition and wave patterns. Their aim is the study of the environment of living organisms in the Baltic. This research will be important in the future development of the local fishing industry. ('Pravda,' May 10.)

* * *

NEW ICHTHYOLOGY LABORATORY OPENS

A new ichthyology laboratory to study the biology of valuable commercial North European fish species has been opened by the Polar Research Institute of Fisheries and Oceanography.

To Study Salmon

The laboratory's new station at Por'ya Guba on the Kola Peninsula (Kandalaksha Gulf) will conduct research on Atlantic salmon. Surveys are planned of the principal salmon spawning grounds on the Ponoy, Varzuga, Umba, and Kola rivers.

Breeding Studies

Three fish hatcheries on Kola Peninsula are studying the biotechnical aspects of Atlantic salmon breeding. They are releasing fry directly into the sea, not into rivers. ('Vodnyi Transport,' Apr. 5.)

* * *

FISHERMEN ASKED TO AID ACADEMY OF SCIENCES

Rocks caught in the trawl net of a Soviet fishing vessel in the southeast Atlantic may contribute to the knowledge of phosphorite formation on the ocean bottom, according to a scientist of the Oceanology Institute of the Soviet Academy of Sciences. The rocks had been sent to the Institute for analysis.

Rock Samples Sought

The scientist was appealing to Soviet fishermen to send the Institute samples of rocks lifted in nets. He asked for precise data on vessel location, trawling depth, and total weight of "rock catch."

Soviet fishing vessels operate in all oceans at all latitudes and can assist Soviet oceanologists in exploring various phenomena. ('Vodnyi Transport,' Apr. 17.)

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USSR (Contd.):

POLYETHYLENE BAGS USED FOR FREEZING FISH

For the last 2 years, AZCHERRYBA (Azov-Black Sea Fisheries Administration) trawlers have been wrapping frozen fish blocks in polyethylene bags. This makes it possible to store them up to 5-6 months. With conventional freezing procedures (without wrapping), glazing disappears after 2-3 months, fat becomes rancid more rapidly, the fish dries out, and its quality deteriorates.

About 1,500 metric tons of polyethylene-wrapped frozen fish were put on the Soviet market in 1967. Chemical laboratories of various fish-processing plants had approved its quality after prolonged storaged tests. They established that water vapor maintains a constant pressure inside the bag. This slows sublimation of the ice and makes it possible to retain glazing for 5 to 6 months.

Tested Aboard Trawlers

Aboard 2 'Tropik'-class stern trawlers, tests with sardines and horse mackerel revealed that polyethylene-wrapped frozen fish not only retained its high quality after 5 months of storage but could be used for canning and smoking without previous sorting. Glazing on the fish blocks was virtually intact. Unwrapped fish blocks lost their glazing during same period. Frozen unwrapped sardines yellowed and smelled slightly of rancid fat; the horse mackerel were dark on the surface with slight subcutaneous yellowing. Both had to be carefully sorted before further processing.

Although wrapping operations have pushed up frozen fish costs 17 rubles (US$18.70) per ton, savings resulting from longer storage life, reduced waste, and improved quality will compensate for the added cost. ('Rybnoe Khoziaistvo,' Feb.)

Recent Development

In U.S. and Western Europe, fishery products have been wrapped in plastic bags for over a decade. In USSR, both fishing and marketing are controlled by state, and most investments have gone into developing a large fishing fleet. The movement to improve quality and packaging is quite recent.

* * *

NEW BOTTOM TRAWL DESIGNED

A new bottom trawl has been designed by the Central Design Office of the Northern Fisheries Administration. Its main feature is the 5.2-meter-high opening, twice that of conventional trawls (2.6 meters) used by Soviet fishing fleet. Tests have shown the catching efficiency of trawl nets with the larger throat considerably greater.

The new bottom trawl was approved for mass production. Its distribution will begin this year. ('Vodnyi Transport,' Apr. 8.)

* * *

TO EXPLOIT NORTHEAST ATLANTIC SNIPEFISH FOR FISH MEAL

Large commercial concentrations of snipefish have been discovered in the northeast Atlantic. The Soviets plan to develop a large-scale fish meal fishery there. Because it is small (8-11 cm. or 3-4 inches), the species appears unsuitable for food.

Area Surveyed

Surveys were conducted Aug.-Dec. 1967 and Mar.-June 1968 by 2 vessels of the Northern Exploratory Fishing Bureau of SEVRYBA (Soviet Northern Fisheries Administration). They covered a wide area of northeast Atlantic, between 33° and 50° N. latitude and 10° to 35° W. longitude. Area includes West European and Iberian Basins, Azores Plateau, Azores Rise, and Azores Islands. In Oct. 1967, large commercial concentrations of snipefish were discovered in an 8,400-square-mile area, west of the Iberian Peninsula. In Apr.-May 1968, large schools were tracked south of 39° N. latitude in a 300-square-mile area on Gettysburg Seamount, north of Madeira, and southeast of Azores.

Electric Light Fishing

At night echo-sounders located snipefish schools both at 30-70 meters and near the surface. Snipefish react to electric light and will gather in large schools in an area lit by blue surface lamps. The school follows the light moving very slowly in a horizontal direction. However, vertical movements are fast, and the school may drop rapidly to 110 meters. If the blue light is switched off and a red light turned on, the school rises rapidly to surface, "boils," makes considerable

USSR (Contd.):

noise, and stays in the illuminated area, circling at 2-3 meters.

Catches

Catches, as high as 10 metric tons per haul, averaged 2 to 5 tons a haul. SRTM-class vessels fishing with electric light can catch 20-30 tons a night. Electric light fishing with pumps, as practiced in the Caspian, has been recommended. ('Rybnoe Khoziaistvo,' Jan.)

* * *

PLANS TO FISH HAKE OFF CAPE TOWN

The R/V 'Atlant' has discovered dense schools of deep-sea hake in a 240 square mile area off Cape Town (South Africa) at depths of 280 to 420 meters (918-1,370 feet). The Soviets have not yet exploited Cape Town fishing grounds commercially, although reportedly these grounds have a great potential.

Atlant is a vessel of the Atlantic Research Institute of Fisheries and Oceanography and the Institute now is drawing up plans for large-scale fishery operations off Cape Town. ('Vodnyi Transport,' May 22.)

* * *

'VITIAZ' IS ON 45TH SCIENTIFIC CRUISE

The Soviet research vessel Vitiaz left Vladivostok on April 23 for the Sea of Okhotsk. Final destination is the Gulf of Alaska and the Aleutian Trench, where scientists will carry out complex oceanographic work and study biological phenomena at great depths.

The vessel returned in March from a 4-month research cruise in equatorial Pacific.

United Kingdom

MERGER CREATES FISHING FLEET OF 120 VESSELS

Arrangements were expected to be completed by July 1 for the merger of Britain's 2 largest deep-sea trawler fleets. Merger under one company would supply about half the white fish landed in Hull and Grimsby and about one-fifth all British-caught supplies.

The fleet will number about 120 vessels, including 10 freezer stern trawlers, one of the world's largest.

Reasons for Merger

Talks began in August 1968 with the help of the Industrial Reorganization Corp. The intention was to improve the efficiency and productivity of the deep-sea trawler industry by combining its many companies. This would provide basis of a strong, successful company capable of introducing new managerial and other skills.

Ross & Associated Fisheries

Originally, 3 of the largest companies were involved--the Ross Group, Associated Fisheries, and Boston Deep Sea Fisheries. Earlier this year, Boston withdrew.

The fish-distribution interests of both groups will be operated separately--competing with each other and the distributive trade. ('Fishing News International,' May.)

Norway

FROZEN FILLET EXPORTS TO U.S. INCREASE

Production and sales of frozen fish fillets have been exceptionally high for the past year. There were ample supplies of cod and other groundfish and a brisk demand in major export markets.

In 1968, exports to the U.S. almost tripled to 22,200 tons. About 25% of the frozen fish fillets exported to the U.S. was supplied by "Nordic Group A/L". In Feb. 1968, Nordic group was granted export rights to the U.S. for one year. (These rights have been extended for another year.)

Frionor's Rising Sales

"Norsk Frossenfisk A/L" (Frionor) enjoyed exclusive export rights to the U.S. until last year. Frionor reports that its rising sales in the U.S. are due partly to increased capacity at its New Bedford fish plant.

Norway (Contd.):

Frionor also reports changing consumer preferences in the U.S., including an increasing demand for "natural" fish products (whole, unskinned frozen fillets). (U.S. Embassy, Oslo, Apr. 26.)

Denmark

MORE STERN TRAWLERS FOR FAROE ISLANDS

The Faroese fleet has been dominated by many wood and steel longline vessels and relatively few large steel side trawlers. By late 1968, 14 modern steel longline vessels had been converted to power-block purse seining; 5 new purse seiners were on order. One or 2 stern trawlers were delivered during 1968 and 3 were purchased in 1969.

Two of the new vessels will supply herring to fish-meal plant at Fuglefjord. One is a freezer trawler delivered by Norwegian yard.

The Faroese firm that took delivery of modern freezer stern trawler in late 1968 plans to own and operate about 10 similar vessels within 5 years. The factory freezers were designed primarily to supply U.S. market for frozen cod blocks.

One owner recently commented that U.S. demand for frozen Faroese cod blocks is excellent. His firm had contracts with 9 of largest U.S. cod block buyers.

Faroese trawler owners claim their operations involve no risk whatsoever. (U.S. Embassy, Copenhagen, May 23.)

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EXPORTS OF FROZEN FILLETS

Danish exports of cod fillets to the U.S. resumed following low prices and stagnation in fall 1968. Supply had been greater than U.S. demand. The situation improved early in 1969. This was due to steadily growing U.S. consumption--and because fisheries on several North Atlantic cod-fishing grounds declined during 1968.

Plaice Fillets Exports Drop

Exports of plaice fillets to Britain have declined as a result of the 10% customs duty applied in late 1968. This duty caused considerable difficulties for Danish fillet exporters. They produce 10,000-11,000 metric tons of plaice fillets per year, much of which has gone to Britain.

New negotiations on the frozen fillet problem began May 20 in London. Arrangements made there will enter into force in Jan. 1970. The Nordic countries, which protested strongly the British duty, hope it will be removed or relaxed. (U.S. Embassy, Copenhagen, May 23.)

Greenland

PROBLEMS CONTINUE IN FISHERIES

The Director of the Royal Greenland Trade Department (RGTD) reported a loss of US$2.7 million during 1968. RGTD processes about 80% of Greenland's catch. The loss was due to a drop in the cod catch and to difficulties on world markets for major Greenlandic fishery products. Fishermen fear that cod have left the Greenland coast, but biologists say it is still present, though the population fluctuates greatly. RGTD purchased 17,500 metric tons of cod in 1968 down 30% from 23,200 in 1967. Private fish processing plants in Greenland reported a 2% decline. Districts north of Godthaab, Greenlandic capital, experienced a 60-80% decline in cod catches, apparently a result of smaller stocks.

West German Competition

West German stern trawlers were said to have accounted for the greatest share of the increase in total catch from waters off Greenland. Their average daily catch was more than 20 tons. The Germans begin fishing as early as December, continue through July, and withdraw during August.

New Stern Trawlers

Biologists have emphasized that the cod stocks have been fully utilized for some years and that if Greenlanders desire greater catches, they must compete with other countries fishing the same grounds. The delivery of 'Nuk,' the Trade Department's large, new

Greenland (Contd.):

Norwegian built, stern trawler should help. The new vessel is fully equipped with modern electronic equipment. She will operate both bottom and midwater trawls. The Nuk is expected to operate at a yearly loss of about US$133 thousand, interest and depreciation included. Her annual catch is estimated at 3,000-4,000 tons. She will be used to train Greenlandic fishermen and will provide experience needed to operate the next two vessels in this series. These are expected to enter the fishery in 1971.

Plans for Future

Despite an unsure future outlook and the great expense of investing in large seagoing vessels, the RGTD Director said it would be wrong to halt development now. Basic concepts have still not yet been tested fully, he added. The Director considers that the Danish Government must support initial development of the high-seas fishery because it is the sole basis for industry in Greenland.

Subsidy Refused

The Greenland fishermen's proposal for State support was refused by the Minister for Greenland recently. The Minister said that fishermen in "South Denmark" do not receive such subsidization. The basis for the fishermen's request was a drop in income from US$4 million to US$2.7 million in 1968. The foreman of the Greenlandic Fishermen's Association pointed out that if the fisheries do not improve significantly in 1969, many members will be unable to meet payments on their vessels. (U.S. Embassy, Copenhagen, May 23.)

West Germany

BUILDS 3 TUNA VESSELS
FOR PORTUGAL

Three 34-meter (111.6-ft.) long tuna purse seiners for the Lisbon-based firm, Congel Cia de Pesca e Congelacao de Cabe Verde S.A.R.L., have been built in the Bremerhaven yard of A. G. 'Weser' Work Seebeck. The 'Salamanza' was completed at the end of February. She left soon after for St. Vincent in the Cape Verde Islands. The 'Mordeira' and the 'Pedro Badejo' were completed about a month later.

Purse Seining

Each vessel carries a 17-ton, 1,500 m. (4,920 ft.) long net, accommodated on a special platform on the afterdeck. Normally in purse seining, the skiff positions the net in a wide circle, while the mothership stays on station and pays it out. However, because of the great size and weight of the nets this order will be reversed. The 150-hp. skiff (carried aboard mothership) will stay on station. The net will then be closed and hauled in the usual manner, the fish will be brailed out, and the skiff hoisted aboard. Derricks with a capacity of 2 tons and 10 tons will be used. The large tuna purse seines will be handled with a power block.

Freezing Method

The fish is deep-frozen in stages through brine baths starting at a temperature of -1° C. (30.2° F.) and ending with a brine temperature of -7° C. (19.4° F.). After 72 hours of brine-freezing, the fish are dry-frozen at -18° C. (-0.4° F.).

Other specifications of the 361 gross ton vessels are: breadth 9.30 m. (30.5 ft.), and height to main deck 4.40 m. (14.4 ft.). They are fitted with 1,000-hp. 380 r.p.m. engines giving a speed of $11\frac{3}{4}$ knots. ('Fishing News International,' May.)

Changing Icelandic Fisheries

David K. Sabock

Fishing, Iceland's most important industry, accounts for 90% of her exports. Historically, fishing has dominated the national economy, placing Iceland in the vulnerable position of a country with a one-crop economy. That crop is in trouble. Few alternatives are available. Landings have declined, international market problems have developed, and the processing industry suffers from high costs and overinvestment. These troubles have led to extensive government assistance to the industry, and caused serious problems in foreign exchange earnings. For example, the kronur had to be devalued twice in the last year--from 43 per US$1.00 to 58 to the dollar and, in November 1968, to 88. This was not enough to prevent a proliferation of labor unrest and requests for government aid. The fishing industry is so important to the economy that any governmental action or inaction carries heavy political consequences.

Iceland is seeking membership in the European Free Trade Association (EFTA). This has prompted considerable local interest in the probable treatment of Iceland's products in intra-EFTA trade, and in duty and quota treatment for frozen-fillet exports to Great Britain in particular. Politically, these negotiations are among Iceland's most controversial issues.

Major Changes

The industry is undergoing major changes. Effort is shifting away from herring towards the more valuable groundfish species. More emphasis is being given to increased pre-export processing of fishery products. A more efficient processing industry is being sought through plant closings and mergers.

Dramatic Decline in Landings

Although the catch tripled from 1956 to 1966, landings have fallen drastically since. After a record 1.2 million metric tons in 1966, the approximately 6,000 Icelandic fishermen caught only 599,000 tons in 1968--33% less than 1967.

Mr. Sabock is Foreign Affairs Officer, Office of Foreign Fisheries.

Herring Catches Shrink

The tremendous drop in herring catches since 1966--over 80%--is the primary cause of the decline, just as the large increase in herring catches was responsible for the boom years of the mid-1960s. Despite this, herring still made up almost 25% of the 1968 catch; herring and capelin together supplied nearly 40%. Two years earlier, two-thirds of the catch was herring; in 1967, it was half. Reduced herring catches have been attributed to fluctuating weather conditions adversely affecting the Atlantic-Scandinavian stock migrations. It is possible that the Scandinavian herring resource has shrunk and may not recover in the near future.

Cod Catches Increasing

Cod was the dominant species in 1968 and accounted for 40% of the catch. Over 235,000 tons were landed, 15% above 1967 and slightly better than 1966. This large percentage of cod reflected not only significantly lower herring catches, but a concerted effort to fish other species. Saithe, haddock, and ocean perch were other important landings. These species, with cod, herring and capelin, made up 93% of the landings.

1963-1968 Catches

Year	White Fish	Herring & Capelin	Total
	.... (1,000 Metric Tons)		
1963	374.8	303.9	679.7
1964	418.5	553.0	971.5
1965	386.3	812.7	1,199.0
1966	344.7	895.6	1,240.3
1967	337.8	558.7	986.5
1968 1/	378.3	221.0	599.3

1/Preliminary.

Changes in Utilization

In recent years, most of the catch has been used for reduction. It demonstrates a tendency to use herring and capelin for fish meal and oil. This tendency was reversed in 1967 and 1968. The decreased herring catch and low prices in the international fish meal market have combined to reduce the proportion of the catch used for industrial products.

Freezing Increases

Freezing, reduction, and salting are the primary forms of processing, but there have been changes in their relative importance. The amount of fish frozen increased in 1968 over 1967; this replaced reduction as the principal form of processing. The output of salted fish also exceeded the amount used for reduction. In 1968, 34% of the catch was frozen, 24% salted, and 22% processed into fish meal and oil. In 1967, 53% had been reduced, 19% frozen, and 14% salted. Another significant change in 1968 was the large increase in the amount of canned fish. Although still a very small portion of the whole, the importance of canned fish probably will increase over the next few years. The stimulus for this development is the same that caused the other utilization changes in 1968--an emphasis on those forms of processing that command the highest export value and promise the best marketing prospects.

Fish Meal & Oil

For fish meal and oil production, 1968 was the poorest year since 1960. Fish meal production declined 51%; it was 112,800 tons in 1967 and 55,000 in 1968. Oil output dropped 79% from 70,000 to 15,000 tons. Iceland has about 48 plants with individual daily capacities ranging from 100 to 1,500 tons. Eight of the largest plants are state owned.

The almost complete loss of the Nigerian market over the past two years also has cut into stockfish production and exports. The better quality raw material was frozen or salted. Attempts to find or develop alternate African markets have not been successful.

1967 & 1968 Catch Disposition

	1968	1967
Fish:		
Quick frozen	202,237	167,203
Stockfish (unslated)	15,174	59,396
Canned	1,444	882
Smoked	21	19
Salted	115,178	70,454
Reduction	4,431	2,515
Herring:		
Salted	28,834	53,469
Frozen (bait)	9,024	15,735
Reduction	132,631	473,240
Home Consumption (fish)	7,015	8,549
Crustaceans:		
Frozen	4,825	4,155
Canned	113	84
Home Consumption	3	-
Fish landed abroad	78,367	41,625
Total	599,297	896,526

Decreased Exports

Exports of all types of fishery products (285,000 metric tons in 1968) were down 27% from 1967 and 44% from 1966. Export value in 1968 was US$78.1 million, a 13% decline from 1967's US$89.9 million. Kronur devaluation had its effect on foreign exchange earnings; kronur value of exports increased in 1968. The export decline was due to lower shipments of fish meal and oil. Most exports--43%--go to EFTA countries. The Common Market countries, the U.S., and eastern European nations each take about 16%.

1967 & 1968 Exports

	1968	1967
Fish Meal	67,463	130,645
Fish Oil	30,132	78,723
Fillets, frozen	48,271	40,720
Salted Herring	34,706	28,518
Other Salted Fish	29,715	21,733
Iced Fish	32,268	21,933

Changes in Fleet

The purse seine fleet is growing, but the deep-sea trawler fleet is dwindling. Efforts to achieve a more profitable operation are forcing a changeover to small boats that can fish for better quality products.

Fishing Areas

The principal fishing grounds for Iceland are her coastal waters. There are extensive shallow water areas surrounding Iceland; particularly long shelf projections radiate from the southeast and southwest coasts. Cod and other bottomfish are fished along the south and west coasts. The herring fishery centers off the north and east coasts. Normally this is a coastal fishery but, in 1967 and 1968, the herring moved from the Jan Mayan area away from Iceland, instead of towards it, as they usually do. Fishermen had to go far into the North and Norwegian Seas. Distances were so great (over 800 miles from Iceland) that carrier vessels had to be pressed into service to bring the fish from catcher vessels to the mainland. The ocean perch fishery is off the east coast of Greenland and in ICNAF subarea 3K.

Government Assistance

Within the last year, the government has increased its share of the price equalization fund, which is designed to offset fluctuation

in export prices. It has provided money for leasing herring carrier vessels, US$3 million to alleviate unemployment caused by declining catches, and helped processors to reorganize. Along with the November 1968 kronur devaluation, the government provided an expanded price equalization fund for exports. Although a similar proposal to establish a broadened price equalization fund for all fishery products had been passed in 1967, it was overtaken by 'forced' continuation of 1967 subsidies through 1968, and by special assistance to freezing plants. Previously, only frozen fishery exports had been covered by this fund. The devaluation rate for 1968, contrasted with 1967's, was selected after an intensive study to permit all segments of the industry to operate without deficits, or subsidies, or financial aid. The government hoped to prevent continuation of the 1967 and 1968 legislation covering a variety of subsidies.

Government fishery policy comprises reorganization of the share payment system, deducting increases in fishing vessel owners' operating costs before crew shares are paid; reliance on banks and investment funds for investment in fishery export industries (by special subsidies and government assistance); and special legislation for vessel owners whose foreign debts have been escalated by devaluation. The fleet has been faced with higher costs in recent years, caused partly by new technological requirements, and the owners' part of income has been frozen through share-or-catch agreements. The government is attempting to correct the imbalance in the wage payment system and to lighten the owners' financial troubles.

The Future

The most important fishery development in the future is likely to be increased emphasis on cod fishing: from smaller boats (up to 200 tons), trawlers (the government will shortly bid out the construction of four 500-700-gross-ton stern trawlers), and the larger boats intended originally to catch herring. This increased emphasis is likely to result in greater price differentials between high- and low-quality fish from the vessels. This means more of the catches will be iced in boxes aboard the boats--and should prevent vessels overloading with catches that are undifferentiated in quality.

PRIMARY SOURCES

Hagtidindi. Vol. 54, no. 3, March 1969

Iceland's Fishing Industry, 1967. Foreign Fisheries Leaflet #44, Office of Foreign Fisheries, Bureau of Commercial Fisheries, Sept. 1968, 24 pp.

Iceland's Recent Fisheries Trends, and 1968 Catch and Output. Office of Foreign Fisheries, Bureau of Commercial Fisheries, Mar. 1969, 3 pp.

Statistical Bulletin. Central Bank of Iceland, Vol. 38, No. 1, Feb. 1969, 16 pp.

U.S. Embassy, Reykjavik, various despatches.

LATIN AMERICA

Chile

Pacific Salmon Introduced into Southern Streams

John W. DeWitt

In January 1968, about 30,000 eyed eggs of the coho salmon, *Oncorhynchus kisutch*, arrived in Chile to begin a new program for the introduction of Pacific salmon. The last liberations of salmon eggs and fry were made many years ago. Several species were stocked then, but there is no clear evidence that establishment occurred, even initially. Investigations in 1966 and 1967 failed to turn up any indication that Pacific salmon were established in Chilean waters at the time, or ever had been, contrary to some reports.

Many Southern Streams Suitable

In 1966, observations along nearly the entire coastline revealed hundreds of streams, apparently suited for Pacific salmon, in Chile's southern third. The fact that most, or perhaps all, of these streams have populations of rainbow, brown, or eastern brook trout attests to their general suitability for salmonids. The presence of sea-run rainbow and brown trout in some areas also indicates that the marine environment is suitable for Pacific salmon. The trout generally are underexploited, mostly because of the sparse population, and the relative inaccessibility of the streams. Establishment of Pacific salmon could produce a new and accessible coastal fishery with these largely inaccessible streams serving as spawning and nursery grounds.

Washington Donated Coho Eggs

The coho eggs shipped last year were donated by the Washington State Department of Fisheries at the request of the Chilean Division of Fisheries. The eggs were incubated, and the resulting fish reared to the downstream migration (smolt) stage, in the hatchery at Rio Blanco. A Peace Corps volunteer, Harry Gibson, now is assisting with their rearing and stocking.

About 12,000 coho smolt were liberated in Estero de la Zorra, a small stream near Puerto Montt, last winter (spring in Chile). A few others were stocked in spring 1969. The stocked fish averaged about 95 mm. in length and 85 to the pound. The main results will be realized when the adult salmon return to spawn in the Chilean fall of 1970.

An additional 50,000 coho eggs donated by the Oregon State Fish Commission were shipped to the Rio Blanco hatchery in January 1969. An excellent hatch occurred and the smolt will enable the program to continue. More species, and larger numbers probably will be stocked if the initial efforts are successful.

Dr. DeWitt is Fishery Biologist, Food and Agriculture Organization, Lake Nasser Development Centre, Aswan, Egypt.

Surinam

SHRIMP INDUSTRY IS GROWING

A U.S. firm has purchased a controlling interest in Surinam American Industries Ltd. (SAIL), Surinam's only shrimp processing and exporting firm. The U.S. firm also acquired all outstanding stock of World Wide Marketers Ltd. of New York City, SAIL's U.S. importer and purchasing agency.

Stimulates Interest

This move was only one among many made recently that have given new impetus to an industry with great potential. Most Surinamers claim it has not developed as rapidly as conditions would have permitted. The exclusive processing and export rights, accorded to SAIL in 1956, will expire on Sept. 17, 1971. There is already a flurry of activity as other companies are organizing to be off and running on that date. Meanwhile, the Government of Surinam has given written assurance to officials of the U.S. firm that the change of management at SAIL will in no way affect SAIL's exclusive rights.

During April, Surinam news media reported the possible formation of as many as five new shrimp companies. At present, only two are beyond the planning stage.

New Processing Plant

International Fisheries of Surinam was established in early April with two Surinamers as directors. The firm's manager is to be a Japanese with some six years' experience as plant manager of a large fish-and-shrimp complex in Japan. Five Japanese trawlers have been purchased. Until 1971, catches will be delivered to SAIL for processing and export. Plans call for the acquisition of more trawlers and for the construction of a processing plant capable of handling the catches of 40-60 boats. The plant should be operational by the end of 1971.

Servicing Trawlers

A shrimp-boat servicing venture is also beyond the planning stage. It is headed by a large poultry producer in Surinam. A Government permit is expected momentarily for the construction of a fuel storage facility, pier, and ice plant to service trawlers based in Barbados and Trinidad. The Texas Company is to build the fuel facility and then lease it to the poultry producer, who will construct the pier and ice plant. The venture is already assured of the business of 120 trawlers that come from Barbados and Trinidad to shrimp in the very productive waters off Surinam. The poultry producer owns a large property adjacent to his chicken-processing plant on which he plans to build a modern shrimp-processing facility.

Aid From Japan

Several other Surinamers have been mentioned during recent weeks as would-be organizers of shrimp companies. However, plans in every case are vague and general. Some reportedly are looking to Japan for the necessary capital and expertise.

The Japanese Ambassador to the Netherlands visited Surinam in March 1969 and promised technical assistance for the fishing industry. Shortly thereafter, the head of the Fisheries Division of the Surinam Ministry of Agriculture, Animal Husbandry and Fisheries, made a quick trip to Japan to confer with Japanese Government officials. Some 15 of the 52 shrimp trawlers now operating out of Surinam fly the Japanese flag. Of some concern to Surinamers interested in the shrimp industry are the Japanese motherships reportedly operating off Surinam.

Licenses

To prevent too great a proliferation of shrimp companies following 1971, the Fisheries Division has indicated that it will probably limit the issuance of licenses to 4 or 5. Some may be split licenses, with one firm given the right to construct a processing plant, another an ice plant, another the maintenance of a shrimp fleet, etc.

SAIL's Processing Facilities

The SAIL's present facilities are among the best to be found anywhere. Officials of the U.S. firm have indicated that they will expand the plant's capacity. It now has two blast freezers capable of freezing 55,000 pounds of shrimp a day. Cold-storage facilities can accommodate 500,000 pounds at once, and four ice plants have a daily output of 100 tons.

Shrimp Fleet

Expansion of processing capacity should mean a corresponding increase in the Surinam-based shrimp fleet. Presumably these vessels will come from either the U.S. or Japan. Of the 52 trawlers that currently claim Paramaribo as home port, 30 fly the U.S. flag; 15 the Japanese; and 7 the Surinam. Among the latter are the 5 trawlers recently acquired by International Fisheries of Surinam.

Surinam (Contd.):

Exports

Exports until now have generally shown a healthy buildup from year to year. They should increase even more markedly during the period immediately ahead, with most going to the U.S. During the first nine months of 1968, exports surpassed the total for the full twelve months of 1967. (U.S. Consulate, Paramaribo, May 19.)

Shrimp Exports		
	1967	Jan.-Sept. 1968
	. . . (1,000 Lbs.) . . .	
Total	2,350	2,584
To U.S.	1,838	2,346

Mexico

SHRIMP PRODUCTION DECLINES

Due to reduced early season catch, Mexico's 1969 shrimp production is unlikely to show much improvement over 1968. As market prices are expected to be strong, an estimated 5% increase in overall value could result. Total volume of Mexican shrimp catches for 1968 was about 36,000 metric tons. This was 6.7% of a total fishery production of 240,071 tons.

Other food fish and shellfish should hold their own with last year. Industrial products are expected to increase about 10% in value. Considering the total value of all segments of the fishing industry, a net growth of about 6% is expected in 1969, compared with a decline of 6% in 1968. (Reg. Fish. Attaché, U.S. Embassy, Mexico, May 27.)

Peru

FISH MEAL OUTPUT & EXPORTS DECLINE SLIGHTLY IN JAN.-APR. 1969

During Jan.-Apr. 1969, Peru's production and exports of fish meal fell off a little from the same period in 1968.

	1969	1968	1967
	. . . . . .(Metric Tons).		
Fish meal production:			
Jan.	240,495	284,021	287,466
Feb.	17,357	191,575	109,644
Mar.	325,549	155,233	163,512
Apr.	240,763	212,954	226,047
Total	824,164	842,883	786,669
Fish meal exports:			
Jan.	140,283	192,056	100,281
Feb.	185,938	188,222	115,673
Mar.	188,225	170,107	117,282
Apr.	195,925	167,027	118,458
Total	710,371	717,412	451,694
Stocks on hand Apr. 30	490,116	712,506	701,508

April Set Records

April figures set new production and export records for that month. Stocks on hand April 30 were the lowest for that date in 4 years.

Prices for fish meal reached US$171 per metric ton c. & f. Hamburg in May; prices for deliveries later in the year were somewhat lower.

The 1968/69 anchovy season closed May 31 and will reopen September 1.

Brazil

TERRITORIAL SEA EXTENDED TO 12 MILES

On April 28, 1969, Brazil extended her territorial sea to 12 nautical miles, measured from the sinuosities of the coastline at mean low water. Brazil previously claimed a 6-mile territorial sea and a contiguous fisheries zone between 6 and 12 miles from shore. No plans are known for greater claims of territorial sea or fisheries jurisdiction.

Brazil is party to none of the Geneva Conventions on the Law of the Sea, but she has adopted domestic legislation closely paralleling the Convention on the Continental Shelf. (U.S. Embassy, Rio de Janeiro, Apr. 29, and other sources.)

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ASIA

Japan

FISHERY CATCH SET RECORD IN 1968

The fishery catch (excluding whales) reached a record 8,553,000 metric tons in 1968. This was 9% over 1967's 7,851,000 tons--and exceeded 8 million tons for the first time. The high was attributed to increased landings from the distant-water trawl and off-shore fisheries. These rose 17% and 12% over 1967.

1968 Tuna Catch (Includes Billfishes)		
Type of Fishery	1968	1967
	. . (Metric Tons) . .	
Distant-water long line	339,000	354,000
Distant-water pole-and-line skipjack	126,000	142,000
Coastal pole-and-line skipjack . . .	70,000	78,000
Coastal tuna long line	77,000	75,000

Species

The high catch of Alaska pollock (used for minced fish) in the Okhotsk Sea, Bering Sea, and the North Pacific was particularly noteworthy. Mackerel and squid landings also were good. The 1968 tuna catch declined somewhat from 1967. Government statistics on catches by species should be published in August. ('Suisan Tsushin,' May 2.)

* * *

SALMON PRICES SET FOR 1969

The Japan National Federation of Salmon Fishermen's Cooperative Associations (representing catcher vessel owners) has agreed with Northern Waters Salmon Mothership Council on 1969 prices for fresh whole Pacific salmon delivered by catcher vessels to motherships.

The increase--about ½ U.S. cent a pound for red salmon--is small, but represents a recovery to the 1967 level. In 1968, the price for reds had declined because of the adverse effect of the British pound devaluation on Japanese canned red salmon exports to pound sterling areas.

Salmon Delivery Prices		
	1969 Prices	1968 Prices
	. . . . (U.S. Cents/Lb.)	
Red	31.3	30.7
Chum	24.5	20.2
Pink	15.7	14.9
Silver	25.9	21.0
King	25.9	21.0

Greater price increases for other species were accepted by the mothership firms because of good domestic prices for frozen chums and silvers. ('Suisan Tsushin,' May 9.)

* * *

CANNED TUNA PRODUCTION DROPPED IN 1968

Japanese canned tuna production by Canned Tuna Packers Assoc. members during business year (BY) 1968 (Apr. 1968-Mar. 1969) was 5,051,366 standard cases (48 7-oz. cans). This was about 770,000 cases below previous year's 5,820,662 cases.

The sharp reduction is attributed to: 1) decline in canned light-meat production because of poor skipjack fishing; 2) reduced canned

Table 1 - Canned Tuna Production, BY 1968 and 1967		
Kind of Pack	Quantity	
	BY 1968	BY 1967
	. (No. Standard Cases1/) .	
Canned tuna in brine:		
For U.S. - white meat	1,728,295	2,082,602
" " - light meat	515,216	488,007
Total	2,243,511	2,570,609
For other countries - white meat. .	4,404	5,403
" " " - light meat . .	29,359	23,571
Total	33,763	28,974
Canned tuna in oil	1,584,842	2,236,652
Specialty pack2/	1,189,250	984,427
Total pack of canned white meat .	2,091,404	2,497,999
Total pack of canned light meat. .	2,959,962	3,322,663
Grand Total	5,051,366	5,820,662

1/48 7-oz. cases.
2/Over 90% consisted of canned tuna with vegetables and seasoning.

Table 2 - Canned Tuna in Oil Production, BY 1968		
Species	Quantity	
	BY 1968	BY 1967
	. . (No. Actual Cases) . .	
Albacore	380,709	429,991
Yellowfin	21,115	13,944
Big-eyed	447,314	550,750
Skipjack	1,136,465	1,832,402
Total	1,985,603	2,827,087

Japan (Contd.):

whitemeat production, down about 400,000 cases below production target, because of high albacore prices.

Production of specialty packs rose 20,000 cases. Canned tuna in brine for export to the U.S. packed by so-called "outsiders" totaled 99,839 cases. "Outsiders" do not belong to Association. ('Suisan Tsushin,' May 20.)

* * *

SEEK CAUSE FOR POOR TUNA SEINING IN E. PACIFIC

Yellowfin tuna catches in the eastern Pacific regulatory area during the first three months of 1969 totaled 1,469 metric tons. Longline catches, generally good, far exceeded 1968 catches for the same period, but purse-seine fishing was poor. ('Katsuomaguro Tsushin,' Apr. 30.)

Owners of the 4 Japanese seiners that fished yellowfin tuna in the eastern Pacific regulatory area this year are studying the cause of their disappointing performance compared with U.S. seiners. The seiners left the area after harvesting a total of only about 380 metric tons of yellowfin and skipjack in 2 months. Two of the seiners returned to Japan to enter the purse-seine fishery off Japan. The other two left for the eastern Atlantic to fish yellowfin off west Africa.

The Catch

'Hayabusa Maru' (275 gross tons) caught about 60 tons, 'Nissho Maru' (252 gross tons) 40 tons, 'Hakuryu Maru No. 55' (500 gross tons) 150 tons, and 'Gempuku Maru No. 82' (500 gross tons) 130 tons. The owners attribute the poor performance primarily to unfamiliarity with the fishing grounds--but also to unsatisfactory gear and inadequate knowledge of U.S. purse-seining methods.

Speed-Boat Technique

U.S. seiners use speed boats to encircle fish schools. One seiner may carry 4-5 speed boats. The boats are about $6\frac{1}{2}$ feet long, powered with 100-hp. outboard motors capable of 40 knots. The fishermen use the boats to bring the yellowfin together, like cowboys herding cattle. Since herded yellowfin form into a tight school, they can be captured with a small net.

In contrast, Japanese seiners do not have speed boats, and must use larger nets to surround scattered schools. Some Japanese feel that without speed boats, it may be difficult to make good catches. In view of reports of yellowfin abundance in the eastern Pacific, Japanese purse-seine operators believe that in 2 or 3 years they can overcome the problem of poor fishing experienced this year.

In 1970, Japan-based seiners are scheduled to leave port in late November. Those fishing off west Africa plan to depart in time to arrive in eastern Pacific by Jan. 1--the opening data for yellowfin fishing. ('Minato Shimbun,' May 21, 'Shin Suisan Shimbun,' May 12.)

* * *

ATLANTIC-CAUGHT ALBACORE EXPORT PRICES ROSE IN MAY

Owing to poor fishing, prices for Japanese Atlantic-caught albacore exports to Puerto Rico have been rising. As of mid-May 1969, they were quoted at c. & f. US$500, and as high as $510, a short ton for fish over 40 pounds. In the Atlantic, southwest of Bermuda Island and off Rio de Janeiro, the Japanese were taking albacore mixed with big-eyed and yellowfin.

Indian Ocean Albacore

In the Indian Ocean between Durban, South Africa, and Madagascar, albacore fishing was picking up. Many vessels reported over 3 tons of catch a day. Fishing conditions there are likely to affect the albacore export prices considerably. ('Suisan Tsushin,' May 18.)

* * *

REORGANIZES EASTERN ATLANTIC PURSE-SEINE FLEET

The Nichiro Fishing Co., tuna seining off west Africa, plans to reorganize that operation due to vessel withdrawals. Until early 1969, the fleet consisted of 2 motherships and 7 purse seiners; in 1968, these had fished profitably for the first time in 4 years. However, early this year, 2 of its large, independently operated, seiners--'Hakuryu Maru No. 55' and 'Gempuku Maru No. 82,' each 500 gross tons--went to the eastern Pacific to fish for yellowfin. Two others withdrew because of poor fishing.

Japan (Contd.):

Replacements Planned

Nichiro is seeking permission from the Fisheries Agency to assign to the fleet more seiners of 500- to 600-ton size. It would send these to the eastern Pacific during the slow season off west Africa. ('Shin Suisan Shimbun,' May 19.)

* * *

SUMMER ALBACORE FISHERY IMPROVES, PRICES HIGH

In early May, the pole-and-line summer albacore tuna fishery was extremely slow. Landings at Yaizu and Shimizu averaged 50-100 tons a day. Some observers attributed the poor fishing to a cold-water mass in the Sea of Enshu. Exvessel prices for pole-caught albacore ranged from US$484 to 532 a short ton. Domestic canners were paying around $504 a ton. They have difficulty operating economically at the price. ('Suisan Tsushin,' May 13.)

Slow Through Mid-May

Partly due to the cold-water mass off the home islands, the summer albacore tuna fishery continued slow through mid-May. In late April, 154 pole-and-line vessels were fishing albacore off Japan. April 1-May 16 landings at Yaizu were 3,130 metric tons, compared with 5,000 tons for same period 1968. The lag in landings pushed exvessel prices to about US$529 a short ton. The scarcity also sent up export prices. Direct exports to the U.S. were quoted at c.& f. $545 a short ton on May 20. ('Suisancho Nippo,' May 21.)

Yaizu in May

May 1969 landings at Yaizu were 14,945 metric tons valued at about US$7.45 million. Compared with May 1968, this was a decrease in quantity of 1,338 tons, or 8%, but an increase in value of $621,000, or 9%. The decrease in quantity was due primarily to a decline in southern bluefin tuna landings and to poor pole-and-line skipjack catches. The short supply of southern bluefin and skipjack drove up prices sharply compared with a year ago.

However, albacore landings were 2,500 tons above the same month last year due to the sharp improvement in the summer albacore fishery from the latter part of May. ('Nihon Suisan Shimbun,' June 11.)

Improves in Late May

The fishery began improving from around May 20; landings at Yaizu were 400 to 800 metric tons a day. May landings at Yaizu, Shimizu, and Numazu totaled 8,300 tons. While this does not compare with the 15,000 tons landed at these ports in May 1965 (an excellent catch year), they were far ahead of the past 15-year average of 5,400 tons for the same month. The fishermen are hopeful that, with continued good fishing, this year's supply will be the highest since 1965, when the season's catch totaled 36,000 tons.

Cold-Water Mass Bypassed

The improvement in fishing was attributed to the landward movement of the Kuroshio current bypassing the cold-water mass. This produced a good run near the home islands, where even small boats could engage in the fishery. In addition, sizable albacore concentrations were encountered farther offshore in scattered waters near 32° N. latitude and 144°-155° E. longitude.

Prices

Exvessel prices at Yaizu for pole-caught albacore were around US$479-492 a short ton in late May. Even damaged fish sold around $454 a ton. Cost calculations are based on the current f.o.b. Japan price of $11.80 a case (7-oz., 48's) for canned whitemeat tuna exports to the U.S. These calculations show that raw albacore prices would have to be around $454 a ton for packers to make a profit. Those who pay more are losing money.

Packers Wary

Despite forecasts that June landings would reach 10,000 tons and that this season's total landings would likely surpass 20,000 tons, the packers do not think that present good fishing will continue long--judging from the fish size and meat condition. Therefore, they want to stock up as much canned tuna as they can before the peach-packing season begins in mid-July. Thus, stimulated by a strong demand, the albacore price in Japan continues high, particularly since domestic packers have not been able to obtain much skipjack this year because of poor fishing. In recent months,

Japan (Contd.):

they have been operating only from day to day and have no cold storage inventory.

Export Pack

To meet production requirements for canned tuna exports to the U.S. and Europe, as well as to supply the growing domestic demand for tuna packed in oil, it is estimated that Japanese packers will have to pack at least 2 million cases of whitemeat tuna this year. Assuming that it takes 35-40 pounds of raw albacore to pack one case of whitemeat tuna, the packers would need a minimum of 34,000 metric tons of albacore. Even if the summer pole-and-line fishery supplies 20-30,000 tons of albacore this season, the packers may still not be able to buy the fish at as low a price as they would like to pay. The present high-price level has become the norm, and packers will have to streamline operations and improve organizational structures. ('Suisan Keizai Shimbun,' June 10.)

* * *

SOUTHERN BLUEFIN FISHERY DEVELOPMENTS

Because southern bluefin tuna are less abundant in the Tasman Sea off southeast Australia, about 200 Japanese longliners have shifted to other grounds. About 50 are fishing for bluefin off New Zealand's southeastern coast. Despite declining bluefin catch in that region, which was averaging 0.8 ton per vessel per day, those vessels continue to concentrate on that species because of high price in Japan. The vessels are equipped with extra-low temperature freezer units and modern labor-saving devices.

Other vessels have shifted to Banda Sea and northwestern Indian Ocean seeking bigeyed tuna. ('Suisan Keizai Shimbun,' May 28.)

* * *

KING CRABBING IN BERING SEA

In mid-May 1969, the 2 Japanese crab factoryships 'Keiko Maru' (7,536 gross tons) and 'Koyo Maru' (7,658 gross tons) licensed for 1969 eastern Bering Sea crab fishery were taking king crab and tanner crab.

The Keiko Maru fleet (operated jointly by Nihon Suisan, Hokuyo Suisan, Hokoku Suisan, and Kyokuyo Hogei) began fishing Mar. 12. It was assigned a production quota of 43,404 cases (48 $\frac{1}{2}$-lb. cans) of king crab and 8.6 million tanner crab (including a 5% allowance). The fleet was not doing well in the king-crab fishery. It was concentrating on pot fishing for tanner crab.

Koyo Maru Fleet

The Koyo Maru fleet (Taiyo, Nichiro, Hokkaido Gyogyo Kosha, Hoko Suisan, and Kokusai Gyogyo) commenced fishing Mar. 15. Its production quota was 41,596 cases (48 $\frac{1}{2}$-lb. cans) of king crab and 8.2 million tanner crab (including a 5% allowance). It was making relatively good catches of king crab; tanner crab pot fishing was also satisfactory.

Tanner Crabs Good

The tanner crabs are large and good quality. If their present high price in Japan stays ahead of high processing and transportation costs, the 2 fleets may not suffer as severely from the sharply reduced 1969 king crab quotas as feared. ('Nihon Suisan Shimbun,' May 19.)

* * *

SEEK SAURY IN EASTERN PACIFIC

The fishery firm Nippon Suisan is planning experimental mothership-type saury fishing (night fishing with lights) in the eastern Pacific, August to December 1969. The firm will send one 539-gross-ton trawler as a mothership, and one or two 100-gross-ton trawlers, to the area east of 170° E. longitude, toward the California coast. It will be the first distant-water saury fishing expedition undertaken by any Japanese fishery firm. ('Rafu Shimpo,' June 4.)

* * *

MORE SHELLFISH CULTURE SEABED AREAS ARE DEVELOPED

The Hokkaido Prefectural Fisheries Department and the Japan Land Development Co. are planning to sample shellfish cultures by plowing the bottom with a specially designed marine bulldozer.

Japan (Contd.):

The Japan Land Development Co. developed the prototype "marine bulldozer" for about US$60,000 and tested it in October 1968. It can operate at a depth of 5 meters and will be completed in July 1969. Company researchers will cooperate with engineers of the Hitachi Works to develop a new model by summer 1970 capable of operating at 20 meters. The "bulldozer" is operated from a mothership using 4 cables.

If the marine bulldozer proves efficient, the Fisheries Department will attempt to cultivate shellfish at points along the Hokkaido coast previously considered too rocky to use. (U.S. Consul, Sapporo, May 15.)

* * *

MAY BUILD TUNA
SEINE/POLE FISHING VESSEL

Two fishery firms, Nichiro Gyogyo and Showa Gyogyo, may build a combination purse seine/pole-and-line tuna vessel. It would be the first of its kind in Japan. The vessel will be 350 gross tons, or possibly 500 tons, depending on policy the Fisheries Agency may adopt for such a vessel. The two firms plan to operate the combination seiner on a year-round basis. It will alternate between the eastern Atlantic off west Africa and the eastern Pacific. Their idea is to build a vessel that can either seine or pole fish, depending on fishing conditions. They hope to reduce the problem of uneven fishing previously experienced by Japanese seiners.

Fisheries Agency Policy

However, operation of such a vessel presents a problem for the Fisheries Agency. The Agency's original policy was against increasing scale of experimental purse seining off West Africa beyond present level. Feeling that other firms may also want to build combination seiners, if they can achieve greater efficiency, the Agency plans to study immediately the effect this would have in Japan and abroad. They are particularly concerned because of the world trend toward restricting tuna catches. ('Shin Suisan Shimbun Sokuho,' May 22.)

* * *

SHRIMP VENTURE
IN INDONESIA PLANNED

The Japanese trading firm Toyomenka is scheduled to establish a local corporation in Jakarta to fish shrimp. Toyomenka recently completed one year's experimental shrimping in Indonesian waters with 3 trawlers owned by Kyokuyo Hogei Fishing Co.

The corporation--Tomen Public Fishing Company Industry--will be formed with total capital of US$27 million. This will be fully invested in 10 years ($10 million the first year). It will operate about 10 native vessels and 6-8 Japanese shrimp trawlers southwest of Borneo. Production is expected to total $1.7-1.9 million annually.

Toyomenka-Indonesia Agreement

Toyomenka agreed provisionally with Indonesia in August 1968 to invest 100%. The condition was that on the 10th year it will sell to Indonesia 49% of corporation's shares and, on 16th year, up to 52%.

The Plans

Plans call for establishment of 5 shrimp-fishing bases, and construction of cold storages, processing plants, net manufacturing plants, radio station for fishing vessels, fuel and water supply facilities, and operation of a training center for fishery technicians. Also, 12 vessels (ten 75 feet and 2 carriers) will be built for corporation. All projects are to be completed in 10 years. To maintain these facilities, company reportedly would have to produce annually at least $2.8 million worth of shrimp. ('Minato Shimbun,' May 8.)

India

SHRIMP TRENDS

India's seafood industry seems to be prosperous. It has enjoyed steady growth from the very beginning. The number of plants, exporters, and foreign buyers has increased. However, seafood exports are shrimp. Take away shrimp--and very little remains.

Total exports have been increasing yearly. But this does not mean that shrimp availability

India (Contd.):

is no problem. An analysis of exports by sizes from Cochin 1965-1968 reveals no shortage of shrimp. Exports of sizes under 15 count to 26/30 count have gone up. However, this is no indication that catches of the large sizes off Kerala have increased.

Shrimp Brought to Cochin

In earlier years, shrimp from distant places could not be brought to Cochin for processing; now, without any loss, shrimp can be collected, preserved, and brought to Cochin for processing. The increase in export of larger sizes from Cochin may be due to this development.

Kerala vs. Other Areas

Kerala landings have not shown any consistent increase compared to landings elsewhere. In other areas, landings have gone up according to fishing effort; in Kerala, the landings have declined in relation to fishing effort.

In 1957, a few mechanized boats landed 7,400 tons, mainly in Kerala. In 1967, with over 2,000 shrimp trawlers, Kerala landings increased to only 27,000 tons. The facts suggest a real threat to the existence of the Penaeid shrimp in Kerala waters.

Kerala's & India's Landings of Penaeid Shrimp, 1967-1960

	Kerala	India	Other-than-Kerala Catches
	. . . . (1,000 Metric Tons)		
1967	27	62	35
1966	28	56	28
1965	14	38	24
1964	35	63	28
1963	21	41	20
1962	29	48	19
1961	20	39	19
1960	12	31	19

The average catch-per-hour of a boat trawling in Kerala waters has decreased year after year. Fishing effort has increased tremendously, but return per-unit-of-catching effort has dropped considerably.

Future of Prawns

Is there depletion of prawns off Kerala? Nobody knows. Some experts believe yes; others, no. Nobody has studied exhaustively the biological aspects of shrimp--breeding habits, seasonal movements, growth, and death. ('Seafood Export Journal,' April.)

MID EAST

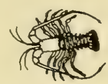
South Yemen

OFFERS POTENTIAL FISHERIES INVESTMENT OPPORTUNITIES

The Gulf of Aden and the adjacent Indian Ocean, considered one of the most productive fishing areas of the world, have been largely unexploited. A substantial change is expected in the next 12 months.

The UN Special Fund is undertaking a survey and training project in the area, and the Soviet Union is showing interest in those waters.

In May South Yemeni officials agreed to permit a U.S. firm to buy and freeze spiny lobster tails from the coast of the Fifth and Sixth Provinces. The large Kuwait-owned Gulf Fisheries has proposed a large-scale fisheries project to South Yemen, but to date no agreement has been reached. Japanese, Spanish, and Italian fishing circles also have shown their interest. (U.S. Embassy, Aden, June 4.)



SOUTH PACIFIC

American Samoa

TUNA PRICES UP IN JUNE

Japanese suppliers and U.S. packers in American Samoa have agreed to a \$5-a-ton increase for albacore and yellowfin tuna deliveries in June 1969. The prices a short ton are: round albacore: frozen \$425, iced \$410; g. & g. yellowfin: frozen \$342.50, iced \$322. The prices are an all-time high for the island.

With the good albacore season approaching in the South Pacific, the number of Japanese vessels based at American Samoa is expected to increase. There were 105 long liners working out of that base in June, including 9 Japanese, 41 Taiwanese, and 55 South Korean. ('Katsuo-maguro Tsushin,' June 10.)

AFRICA

South & South-West Africa

FISHING INDUSTRY DEVELOPMENTS

South Africa's 1968 catch was 1,190,000 short tons (preliminary figure), compared to 948,170 tons in 1967. Increased catch from the 2 South African licensed factoryships more than offset lower catches from the rest of the fleet.

South-West Africa's catch rose to 1,078,900 tons, up from 784,000 tons in 1967. The increase resulted from the granting of 2 additional full pilchard licenses. Each license holder was given a small anchovy quota as well.

Pelagic or Shoal Fishery

The most significant development in 1968 was the record 1,780,000 ton shoal fish catch, primarily pilchards, in waters off South-West Africa. (Figures are for the pelagic or shoal catch in South and South-West African waters, rather than where the fish were landed. Factoryship catches have been combined with the South-West African catch.)

After a decade of carefully controlled expansion, the catch was permitted to more than double within 3 years. The sharp increase and the factoryship operation has divided the industry into two opposing factions, more or less divided along the lines of those who have an interest in the ships and those who do not. A number of scientists and South-West African administrators and business men tend to side with the latter. The principal issue is the threat to the pilchard resource from possible overfishing.

Factoryships

The factoryships had a most successful year, processing 615,000 tons of fish into 157,554 short tons of fish meal and 39,629 long tons of fish oil. The meal probably sold for at least $100 per ton, f.o.b.

The 'Suiderkruis,' after correcting some problems that had plagued her in 1967, reportedly took two-thirds of the total. The 'Willem Barendsz' took a little over 2 weeks for each trip from the fishing grounds to Cape Town to discharge her meal and oil. Suiderkruis transshipped her production directly to a carrier vessel in Walvis Bay harbor, taking about 2 days for the operation. At the end of 1968, Barendsz' equipment was modified to permit pelletization of meal. Attempts by South-West Africa to patrol catcher vessels from the factoryship fleets were generally ineffective.

Exports

Exports of fish meal and fish oil reached record proportions in 1968: 402,876 short tons of meal, and 107,167 long tons of oil.

Canned pilchard pack for cat food, tested in the U.S. market, proved very successful. As a result, over a million cases are expected to be exported to the U.S. in 1969, and more than 2 million in 1970.

Spiny Lobster Fishery

The spiny lobster industry continued to deteriorate in 1968, despite the apparent recovery in South-West Africa's landings.

South Africa: In April 1969, the Commission of Inquiry into the South African Fisheries suspended other activities and concentrated on the lobster industry. The South African export quota had not been reached since 1961, landings had dropped from 12,701 tons (live weight) in 1965 to about 7,000 tons in 1968, and the 1969 season was poor. Between 1964 and 1968, frozen lobster tail exports decreased from 339,643 cases (20 lbs. each) to 203,490 cases.

South-West Africa: Spiny lobster landings were about 9,500 tons (live weight), compared with 5,889 tons in 1967. Two factors accounted for the sharp rise: (1) the 1967 season had been especially poor, due in part to inclement weather, and (2) size restrictions had been eliminated at the beginning of 1968. The fishermen filled the export quota and took the permissible 15% of the 1969 quota as well. However, the catch was largely small-size lobster.

Hake Fishery

South Africa: Hake landings were 87,000 tons (headed and gutted fish), about the same as in 1967. The 'Harvest Sun,' a 171-ft., 600-gross ton, freezer stern trawler ordered by

South and South-West Africa (Contd.):

the Sea Harvest Corporation, was launched at Durban. Irvin & Johnson (I&J) ordered a prototype stern trawler from a British firm; 6 of this class have been tentatively ordered from South African yards.

South-West Africa: The South-West African administration continued to press white-fish processors at Walvis Bay to combine and form a consortium that could compete effectively both on the fishing grounds and in the market place. A full pilchard quota was awarded to the proposed consortium. Profits from this valuable asset would supply the consortium with the needed capital. After considerable discussion about division or ownership, agreement seemed near in first-half 1969. Work on the consortium's reduction facilities was almost completed, and production of meal and oil was expected to begin in mid-1969.

Quality Controls

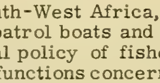
Quality-control proposals have been drawn up by the South African Bureau of Standards. They provide for compulsory standard specifications for frozen fish, frozen marine molluscs, and their products, and for frozen spiny lobster products. It was expected that the proposals would take effect around the beginning of 1970. Revised compulsory standards for canned fish and shellfish were published March 29, 1969. They became effective two months later.

Shrimp Fishery

The South African shrimp fishery continued to falter in 1968. Poor fishing and accidents plagued the Saldanha-Durban operation. That company ceased shrimping activity during the first half of 1969, leaving only one company in the fishery. I&J sent one of its trawlers to do some experimental shrimping in waters off the Angolan coast in early 1969.

Change in Administration

In April 1969, administration over the South-West African fisheries passed to South Africa. The South African Division of Sea Fisheries was given control over South-West African fishery research activity. (Regional Fisheries Attache, U.S. Embassy, Abidjan, June 7.) Important benefits are expected to flow from the change in control. They include joint coordinated research in the waters off South and South-West Africa, and better deployment of patrol boats and research vessels. General policy of fisheries administration--and functions concerning legislation and procedures--will be correlated with a view to rationalizing control. The change also will facilitate discussion of matters of common concern with boat owners and with the industry. ('South African Shipping News and Fishing Industry Review,' May.)



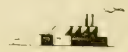
Senegal

NEW SEAFOOD PLANT OPENS

June 6, 1969, marked the formal opening of the new US$390,000 frozen seafood processing plant of the Société Sénégalaise de Produits Alimentaires Congelés (S.P.A.C.). Annual production capacity of the new plant is 2,000 metric tons--1,400 tons of shrimp and spiny lobster, 350 tons of fillet of sole, and 250 tons of other fish. By 1972, production is expected to increase to 3,000 tons providing sales of $5,650,000. Virtually all the present production is exported to Europe. However, the company plans to enter the U.S. and Japanese markets in the future.

French Investment

The new plant is part of the French-owned Amerger group. It will bring Amerger's total investment in Senegalese fish plants to about $1,000,000. This includes factories in Kaolack (Amerger Sine-Saloum, $100,800) and Ziguinchor (Amerger Casamance, $484,000). (U.S. Embassy, Dakar, June 11.)



Zambia

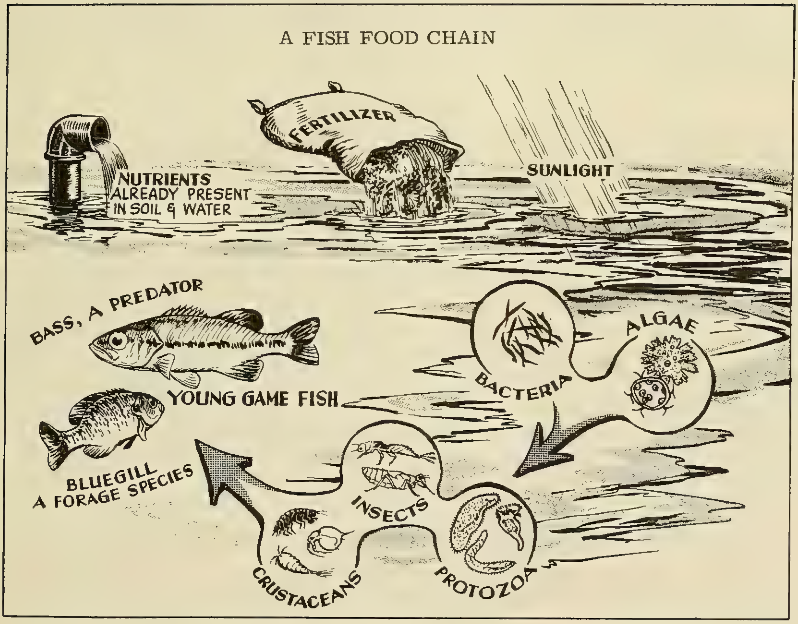
LAKE TANGANYIKA FISHERIES
TO BE DEVELOPED

Zambia's Industrial Corporation (INDECO) was slated to make an initial investment of about US$1.8 million to develop the fishing industry on Lake Tanganyika. Development will be carried out by Lake Fisheries of Zambia Ltd. INDECO holds an 83% interest in Lake Fisheries and a Norwegian firm 15%.

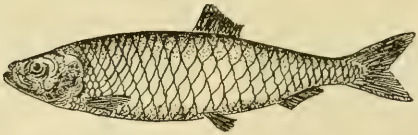
Zambia (Contd.):

The New Company

The new company has acquired all assets, including a factory and boats, of a foreign company that operated on the lake. Lake Fisheries will buy new trawlers, bigger nets, and 25 refrigerated trucks, and install a new fish-processing plant and distribution warehouse. The marketed tonnage of fish from the lake was expected to rise from about 3 to 20 tons daily by July 1969. ('International Financial News Survey,' May 30, from 'African Development,' Mar.)



FOOD FISH FACTS



MAINE SARDINES
(Atlantic herring)

(*Clupea harengus*)

What is a sardine? The word sardine is not the name of just one species of fish but rather a collective name that represents a variety of tiny, soft-boned fish. The name sardine probably comes from the fact that similar, tiny fish, called French sardines, were first found and caught in great abundance around the island of Sardinia in the Mediterranean. The Maine sardine is a member of the Atlantic herring family. Caught and enjoyed by Atlantic coastal Indians long before the first settlers arrived, these tasty little fish are still being caught in the same coves and inlets used by the Indians of long ago.

DESCRIPTION

Maine sardines are the immature young of the Atlantic herring which has an elongated body and are greenish blue in color with a silvery cast on the sides and belly. The tail of the herring is deeply forked and has a single dorsal fin which is directly over the small ventral fin. Scales of herring are large and loosely attached. Herring reach about 4 inches in length by the end of a year.

HABITAT

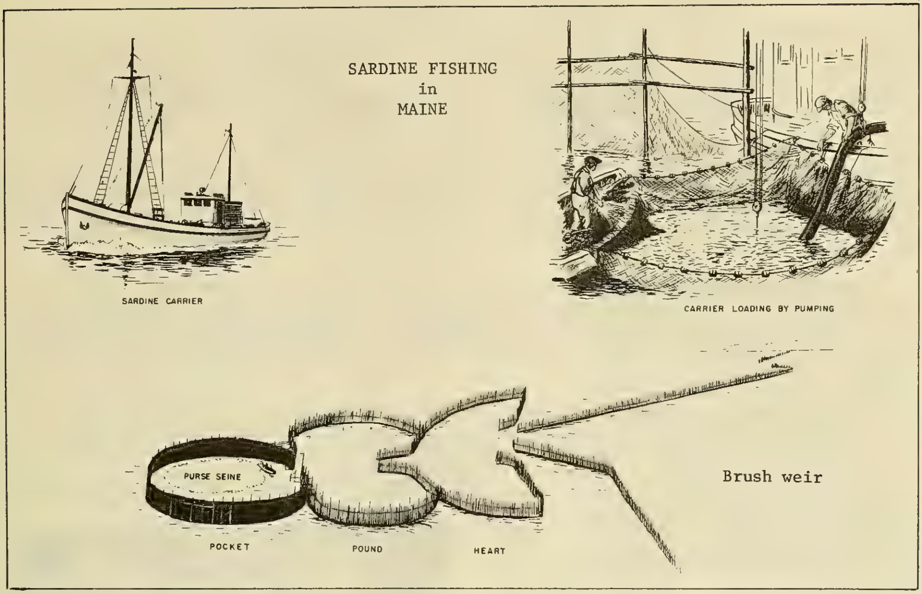
Atlantic herring are found from Virginia north to Labrador and Greenland. The largest number of small herring or sardines caught by commercial fishermen of the United States are found north of Cape Cod with the Maine coastline the center of the industry.

SARDINE FISHING

Sardines are most easily caught in the dark of the moon during their feeding time. Sometimes their movements in the water disturb organisms that give off a phosphorescent light, similar to the light of a firefly. This light makes the sardines easy to see. This phenomena, however, occurs only during the mid and late summer months. Many methods have been used in catching sardines beginning with the brush weirs. This method is said to have originated with the early Indian tribes living along the east coast. This is still used by some fishermen especially when the tides are strong and the waters shallow. It consists of a stationary fish trap which blocks the course of the fish and funnels them into an enclosure. Another method is the stop seine which is a long net stretched across the mouth of the cove after the fish have entered. The purse seine is a more up-to-date method which enables the fishermen to fish in deeper water. The purse seine is circled around the school of fish and the bottom is closed keeping the fish trapped.

A method of harvesting developed by the Bureau of Commercial Fisheries has been of great help to Maine sardine fishermen. This air-bubble hose method consists of a hose pierced with holes along the upper surface and stretched along the ocean bottom around an area containing sardines. Compressed air pumped through the hose causes bubbles to rise to the surface and, since the small fish will not swim through the wall of bubbles, they are trapped.

(Continued following page.)



The use of otter trawls on bottom and midwater fishing areas is also being used. Methods used to find the schools of sardines include aerial spotters, depth recorders, and sounding devices such as sonar.

CONSERVATION

Scientists of the BCF Biological Laboratory in Boothbay Harbor, Maine, have been doing research on herring for the past 20 years. Their research includes all stages of the life history of herring. This research is divided into three parts: (1) all phases from hatching through larval development and up to the time the fish completes its first year of life; (2) the sardine program which concentrates on inshore fish from 1 to 3 years old; and (3) the adult herring program which studies coastal spawners as well as the offshore populations of Georges Bank. Through the third part of the research, scientists have shown that the offshore herring stocks are independent of those fished in coastal waters. This information is vitally important to the Maine sardine industry and may encourage greater exploitation of the offshore herring stocks by other segments of the United States fishing industry. All fishery research has a basic goal to ensure the wise use of a renewable resource.

USES OF SARDINES

Sardines are a valuable source of high quality protein which is needed for building and repairing body tissues. They contain calcium and phosphorus needed for strong bones and teeth and iron needed for healthy, red blood. Sardines provide useful amounts of thiamine, niacin, and riboflavin. Maine sardines are packed in various types of oil as well as mustard and tomato sauces. Packed in flat 4-ounce cans, they are ready to eat at the zip of a can opener, a pull tab, or a key. (Source: National Marketing Services Office, BCF, U.S. Dept. of the Interior, 100 East Ohio, Rm. 526, Chicago, Ill. 60611.)

(Recipe following page.)

LET THE MAINE SARDINE CREW ENTERTAIN YOU

The little fish with the BIG flavor, sardines from Maine, are in good supply again. Delightful to eat just as they come from the can, Maine sardines may also be prepared in dozens of tasty and interesting recipes. They are easy on the budget and time saving too because they are 100 percent edible and shelf ready whenever you want them.

The term sardine covers a wide variety of small fish. The ones caught off the coast of Maine and referred to as Maine sardines are really small, soft-boned herring. These tiny fish provide concentrated high-quality protein as well as other body-building nutrients. They are packed in several types of oil as well as mustard and tomato sauces--a variety to suit every taste. For consumers at the retail level, they are packed in handy, flat, $3\frac{3}{4}$ or 4-ounce cans.

The Maine sardine industry started with one little cannery over 80 years ago; now there are over 30 modern, up-to-date canneries dotting the coast. Over 60 different brands of Maine sardines are packed in these canneries. These tasty little fish can be used in super salads, budget casseroles, delightful dips, satisfying spreads, or as captivating canapes.

Maine Fisherman Potatoes Au Gratin, a new budget casserole recipe from the Bureau of Commercial Fisheries, is a hearty and satisfying dish that could have been created by the wife of a hungry Maine fisherman. This economical dish extends two cans of flavorful sardines into a main dish entree that will feed six. Slices of cooked potatoes are layered with sardines and covered with a tasty cheese sauce. Bakes with a covering of buttery croutons for crispness, this tasty casserole will be ready to satisfy your hungry "fisherman" or family after just minutes baking. So--head for the canned fish section of your market, buy a few cans of Maine sardines and try this satisfying casserole for supper tonight. Sardines from Maine have a way of becoming a Maine food wherever they are tried.

Maine Fisherman Potatoes Au Gratin

2 cans ($3\frac{3}{4}$ or 4 ounces each) Maine sardines
2 tablespoons chopped onion
2 tablespoons melted fat or oil
2 tablespoons flour
1 teaspoon salt
Dash pepper
2 cups milk
1 cup shredded cheese
2 teaspoons Worcestershire sauce
5 cups sliced cooked potatoes
$\frac{3}{4}$ cup soft bread cubes
2 tablespoons butter or margarine, melted
Paprika

Drain sardines. Cook onion in fat until tender. Blend in flour and seasonings. Add milk gradually and cook until thickened, stirring constantly. Add cheese and Worcestershire sauce. Stir until cheese melts. Arrange half the potatoes in a well-greased, $1\frac{1}{2}$ quart casserole. Cover with sardines and remaining potatoes. Pour sauce over potatoes. Toss bread cubes with butter and sprinkle over top of casserole. Sprinkle with paprika. Bake in a moderate oven, 350° F., for 25 to 30 minutes or until lightly browned. Makes 6 servings.

You can have a wide variety of Flavor of Maine recipes which utilize the tasty little Maine sardine. The Bureau of Commercial Fisheries has published a full-color booklet for your use. Send 35¢ to the Superintendent of Documents, United States Government Printing Office, Washington, D.C. 20402, and ask for Flavor of Maine, Fishery Market Development Series No. 11 (I 49.49/2:11). (Source: National Marketing Services Office, Bureau of Commercial Fisheries, U.S. Department of the Interior, 100 East Ohio Street, Rm. 526, Chicago, Illinois 60611.

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INDEX (CONTINUED)

WHAT COMMERCIAL PRODUCTS OTHER THAN FISH ARE OBTAINED FROM THE SEA?

Products obtained commercially from sea water include common salt, bromine, and magnesium. All of the United States' supply of magnesium is taken from sea water, because extraction is cheaper than obtaining it from mines on land. About 75 percent of our supply of bromine is extracted from the sea.

In recent years interest has developed in exploiting the seemingly inexhaustible supply of manganese and phosphate-rich nodules on the sea floor. The American Institute of Mining, Metallurgical, and Petroleum Engineers (AIME) has estimated that there are 1.5 trillion tons of manganese nodules on the bottom of the Pacific Ocean. These nodules contain as much as 50 percent manganese plus smaller amounts of nickel, copper, cobalt, and other metals. Nodules on the sea floor appear to be forming faster than the rate at which the United States is now using manganese, nickel, and cobalt; thus it seems that our reserve of these metals is assured for many years. Phosphorite nodules off the California coast could satisfy California's phosphate fertilizer needs for many years.

Other materials obtained from the sea floor or beaches include diamonds, pearls, sand, gravel, shell, and ores of tin, thorium, and titanium.

Oil is being recovered from beneath the ocean floor in increasing amounts. In 1960, about 8 percent of the free world's oil supply was obtained from this source; by 1965, it had increased to 16 percent. Undersea deposits of sulfur are also being tapped by drilling from platforms in the Gulf of Mexico, as the supply on land dwindles. ("Questions About The Oceans," U.S. Naval Oceanographic Office.)

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As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States -- now and in the future.

UNITED STATES DEPARTMENT OF THE INTERIOR
U.S. FISH AND WILDLIFE SERVICE
BUREAU OF COMMERCIAL FISHERIES

Today's homemaker has become increasingly aware of the need to consider both low cost and variety in preparing meals for her family. The U.S. Department of Interior's Bureau of Commercial Fisheries has provided her with an opportunity to do this in its publication, 'Fish For Compliments on a Budget.' This 20-page booklet is designed to assist her in using fishery products for low-cost meals. It contains 18 recipes and shows how many fishery products can be prepared for delicious and inexpensive eating.

Single copies may be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 for 15 cents. Purchases of 100 or more sent to one address receive a 25 percent discount.

COMMERCIAL FISHERIES Review

VOL. 31, NOS. 8-9

AUGUST-SEPTEMBER 1969

COVER: Concentrating menhaden in pocket of purse seine prior to transferring fish to vessel by pumping. (Photo: Bob Williams)

COMMERCIAL FISHERIES
Review

A comprehensive view of United States and foreign fishing industries--including catch, processing, marketing, research, and legislation--prepared by the Bureau of Commercial Fisheries.

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Gloucester, Mass.

Managing Editor: Edward Edelsberg

Associate Editor: Barbara Lundy

Production Manager
and Associate Editor: Jean Zalevsky

Production: Alma Greene (Senior Compositor)
and Mary Andrews

The Bureau of Commercial Fisheries and The Bureau of Sport Fisheries and Wildlife make up The Fish and Wildlife Service of The United States Department of the Interior.

Throughout this book, the initials BCF stand for the Bureau of Commercial Fisheries.

Address correspondence and requests to: Commercial Fisheries Review, 1801 North Moore Street, Room 200, Arlington, Va. 22209. Telephone: Area Code 703 - 557-4246.

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TO CFR READERS

A mix-up in the printer's mailing of the June 1969 COMMERCIAL FISHERIES REVIEW has delayed delivery to most readers. We regret the inconvenience.

Biologists measure fish aboard BCF vessel to assess fishing's effect on population. Thousands must be measured to determine growth and mortality rates. (R. K. Brigham)

FISH PRICES HIGHER IN 3RD QUARTER 1969 THAN YEAR EARLIER

Although some fish prices dipped seasonally in the third quarter of 1969, most prices were generally higher than in the same period of 1968. This had been predicted by BCF's Division of Current Economic Analysis.

Wholesale prices have been running about 10% higher than last year's, but fresh fish wholesale prices have risen an average of about 14%. Prices for several frozen products have been up about 10%. Wholesale prices for a limited number of canned products averaged fractionally lower.

Supplies

Supplies of most fishery products--haddock is a notable exception--are expected to increase seasonally and be ample for the remainder of the summer.

As of July 1, inventories of frozen fish and shellfish were about 5% above a year earlier. Stocks of shrimp, crabs, and lobster tails were much larger. Fillets and steaks were up 7%--but were offset by lower stocks of round and dressed fish. Stocks of fish sticks and portions were 18% above 1968; production rose 25% in first quarter. Freshwater-fish stocks were about the same as in 1968.

Landings

Landings of the popular New England fish have decreased about 8% this year. Haddock was a third less than the low level of 1968, and ocean perch was off 13%. But flounder and cod were up substantially.

California tuna landings, used primarily for canning, were up 45% due to the heavy catch of yellowfin in the tropical Pacific.

Fish Meal

Three factors are important in determining how much fish meal is used in the U.S.--the number of broilers hatched, fish meal prices, and prices of competing feed ingredients. Broilers hatched in January-May were 7% over last year. In June, menhaden meal was $172 a ton f.o.b. East Coast ports; Peruvian meal was $168.

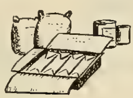
Fish Meal vs. Competitive Products

Fish meal prices also were high in relation to competing products, such as soybean meal. If the high prices and price ratios continue through third quarter, the use of fish meal could fall considerably, as it did in 1965 and 1966 during periods of high prices. It was estimated that, at June prices, fewer than 250,000 tons of meal would be used in third quarter. This would be about one fourth below third-quarter 1968 consumption.

Fish Oil & Solubles

The U.S. consumed 11.2 million pounds of fish oil in first 4 months of 1969--up 5% from last year. Exports were 53.8 million pounds, nearly triple the amount exported in 1968. It was estimated that 8-12 million pounds of oil will be used in third-quarter 1968--slightly above last year. Exports were expected to be at least 21 million pounds.

Declining prices of fish solubles in first 5 months of 1969 indicated relatively weak U.S. demand. Prices of menhaden solubles fell from average $51.25 per ton, f.o.b. East Coast ports, in January, to $47.75 in May. In late May, prices began to increase and averaged $49.75 per ton in June. This increase could indicate an increase in demand. In May 1969, consumption of fish solubles was about 11,100 tons--an increase of over 75% from May 1968.



UNITED STATES

Catfish Farming Grows in the South

A "new" agricultural industry--centuries old in Europe and a thousand years old in Asia--is on the rise in several southern States: catfish farming for sport fishing and commercial sales.

The main catfish-farming States today are Arkansas, Alabama, Mississippi, Louisiana, and Texas. There are more than 700 individual enterprises on over 30,000 acres of farm ponds. These produce about 39 million catchable or market-size catfish and over 50 million fingerlings. Current wholesale value of the "crop" is about $\$10\frac{1}{2}$ million. Income from bait minnows, also raised on fish farms, is $\$8\frac{1}{4}$ million.

The most profitable arrangement, one encouraged by fish culturists, is a fish-rice-soybean rotation that makes fish farming part of agriculture.

Government Aid

The Bureau of Sport Fisheries and Wildlife and BCF work closely with the States to conduct basic research and to provide technical assistance. The U.S. Department of Agriculture provides financial and technical assistance to build and stock ponds. Investigations cover all of fish husbandry--rearing, feeding, stocking, and disease control.

Beginning of Fishery

Catfish culture was first considered seriously in the U.S. in 1917. Notes on rearing, growth, and food of channel catfish, in 'Transactions of the American Fisheries Society,' were based on research by the old U.S. Bureau of Fisheries. But it was not until the late 1940s that research at Auburn University, University of Oklahoma, and U.S. research at Marion, Ala., and Stuttgart, Ark., found catfish-rearing feasible. State hatcheries, especially in Arkansas, then helped. Later, private initiative and capital began to take over, and industry spread.

Recreational Use

Perhaps one-fifth of today's anglers fish in farm ponds. Many children and adults cast their first line and learned to catch a fish in such waters. Anglers can fish only a few minutes and miles from home or office. They can fish a couple of hours in the cool of a summer morning or evening, in the afternoon of warm winter days, or between April showers.

Good pond management can be carried out by the owner in his spare time. Fertilization of water, or use of commercial feed, increases the pounds per pond; angling fees bring in extra cash; farmers simply harvest fish fish to sell on the market.

Good Future for Farming

The Bureau of Sport Fisheries and Wildlife sees a good future for fish farming. More people are accepting catfish for food and sport. The Bureau expects cost-per-pound to drop, production per man-year and production per acre to rise. The Bureau also expects current research to produce catfish that grow faster, are hardier in the winter, and more resistant to disease.

Temperate Tuna Forecasting Is Expanded

Fishermen operating in Oregon-Washington waters this year are receiving additional radio advisory materials through a joint BCF-Oregon State University (OSU) cooperative project. OSU is operating an albacore information service from July 1 to October 1. It is emphasizing sea surface temperatures and concentrating on microscale features along the Oregon coast out to 200 nautical miles.

Daily Messages

OSU transmits a daily message through the Astoria Marine Operator. The messages

are part of the normal weather broadcast at 1015 PDST and 2215 PDST. Each message is run twice; the new message will be the evening one.

In addition to information from BCF's Fishery-Oceanography Center at La Jolla, Calif., and the Weather Bureau, OSU receives reports from aircraft equipped with infrared thermometers, research vessels, and fishing boats (11 outfitted with bathythermographs).

San Pedro Wetfish Fleet Is In Poor Economic Condition

Two BCF specialists, an economist and a fishery biologist, recently completed a study of the economics of the San Pedro, Calif., wetfish fleet. Wetfish include jack mackerel, Pacific mackerel, anchovy, and Pacific sardine.

The Findings

They found the fleet in an unhealthy economic condition: low profits, unusual capital structure, low crew earnings, and decreasing employment. However, despite the overall depressed condition, a few boats have made reasonable profits in recent years. This fact--plus favorable cost analyses of existing vessel types, good estimates of some wetfish stocks off California--may indicate that, with proper market conditions, fleet expansion with surplus vessels from other fisheries would be economically feasible.

New Vessels Uneconomical

At present catch rates and prices, cost analyses show that new vessel construction would not be economically feasible, even with construction subsidies. If catch rates and efficiency were increased through technological research, the situation might change.

Pacific Halibut Landings Increase

Pacific halibut landings by the U.S. and Canadian fleet through July 31 were 35.3 million pounds (dressed weight). This is an increase of 3.3 million pounds, or 10%, over the 1968 period. For the first time since 1966, quotas in most fishing areas were expected to be reached.

High Prices Stabilizing Factor

High prices should keep the vessels from shifting to other fisheries as they did last year, when prices were much lower. Prices have continued upward since the season opened. At the beginning, exvessel prices for medium halibut were 40.6 cents a pound in Seattle, Wash., and 41.6 cents at Prince Rupert, British Columbia. On July 31, prices for medium halibut had reached 45.3 cents at Seattle, and 44.2 cents a pound at Prince Rupert.

Lake Erie Fishermen Reject 30-40% of Catch

Biologists from BCF's Sandusky, Ohio, field station on Lake Erie are investigating the number and species of fish commercial fishermen land and then return to the lake. Working with beach seiners in Sandusky Bay, the biologists report about 40% of the fish are returned for lack of market demand. Most are sheepshead, goldfish, carp, and gizzard shad. A similar situation exists in the trap net fishery, where about 30%, usually the same species, are returned. This selective fishery may be contributing to the lake's undesirably high abundance of unmarketable fish.

Fish Oil May Be Marketed For Human Consumption

Representatives of BCF's Division of Food Science met recently with members of the fish industry to discuss the feasibility of bringing fish oil to the U.S. human food market.

BCF is cooperating with industry and other government agencies to reintroduce fish oil as human food.

Sardine Oil Used 1912-1952

Oil from California sardines was used in human foods in the U.S. from 1912 through

1952. Failure of the resource, and lack of information on using oil from other species, brought in vegetable oils to fill the market void. The menhaden industry particularly is interested in marketing fish oil for people. With the recent emphasis on good manufacturing practices, and esthetic considerations for all human food, present practices must be changed before oil can be used.

Biologist Tests Effects of Lunar Materials on Aquatic Species

James W. Warren, a fish biologist with the Bureau of Sport Fisheries and Wildlife, will test the effects of lunar materials on earth's aquatic species at Houston's lunar receiving laboratory.

Species Used

Warren will work for 2 months with species ranging from small protozoans to flat worms, oysters, shrimp, and fathead and mummichog minnows. The minnows, he says, are something like "guinea pigs of the fish world"--much is known about their normal condition and they are, in many ways, ideal as a laboratory test species.

The main objective of these experiments with moon dust is to detect any elements that may jeopardize life on earth.

Preliminary Tests

Warren emphasizes that his experiments will be only preliminary: to see if any hazards exist before the moon dust is sent to other scientists for more comprehensive studies. His tests will begin after a team of physicists and geologists has spent 3 weeks intensively examining the material for gross cosmic radiation or chemical hazards. These researchers then will distribute the dust to special test groups. Warren's 5-man aquatic research team is one of these groups.

BCF Studies Shrimp-Sorting Trawls in Pacific Northwest

BCF's Exploratory Fishing Base in Seattle, Wash., reports that 3 gear-development cruises involving studies of shrimp-sorting trawls were conducted between April 1 and June 30, 1969. Several trawls incorporating various sorting concepts were evaluated. Trawl performance studies involved observations by SCUBA-equipped personnel during shallow-water testing, and actual test fishing on commercial fishing grounds.

The Findings

Findings revealed that trawls equipped with a vertical sorting panel eliminated virtually all trash fish and invertebrates from the shrimp catch; some smelt and a few small rockfish were retained. The research model--a 3-panel shrimp trawl--was most effective in eliminating trash. Trawls without headrope overhang retained fewer smelt than those having an overhang; this occurred without any apparent change in shrimp catch. Contamination of sorting trawl catches was always less than that found in commercial catches by nearby vessels.

BCF Tests Fresh Halibut Stored in Refrigerated Sea Water

A BCF technologist went to sea early in June to begin a study of halibut stored in carbon dioxide (CO_2) treated refrigerated sea water (RSW). He returned to Seattle, Wash., with freshly caught fish in an RSW unit. The unit was transferred to the laboratory without disturbing the fish in the holding tank. The halibut will be evaluated periodically to determine the effect of the CO_2 treatment on quality and storage life, compared to those of iced 'control fish.'

Bacterial Counts

The first examination was made on June 25 after the fish had been held 21 days. The halibut held in RSW-CO_2 were in excellent condition. Total bacterial counts had not risen above 100 organisms per square centimeter of skin. The bacterial load in the sea water itself was 100 organisms per milliliter.

By comparison, total bacterial counts on the iced control fish were in excess of 1,000,000 organisms per square centimeter of skin. Initial bacterial counts on the fish, prior to storage, were 10,000 organisms per square centimeter.

Sensory Tests

Organoleptic (sense organ) assessment of raw fish clearly indicated that the iced halibut were in very poor condition. Similar assessment of the CO_2-treated RSW halibut showed these fish to be in good condition.

U.S. & Japan Cooperate in Salmon Research

Scientists of Japan's Hokkaido University and BCF are working together to learn more about the early marine life of Alaska's Bristol Bay sockeye (red) salmon. They are interested also in the salmon's environment.

Biologists at BCF's Auke Bay (Alaska) Laboratory are trying to discover the seaward migration routes of Bristol Bay young sockeye salmon. Their study is part of a comprehensive investigation to improve the accuracy of salmon run forecasts.

Japanese Invitation

This year, Hokkaido officials invited BCF's Dr. Richard Straty to board the 'Oshoro Maru' during its Bristol Bay cruise. The vessel is used primarily to train graduate fishery students. BCF saw this as an excellent opportunity to coordinate its Bristol Bay efforts with those of the Japanese.

Under Straty's supervision, BCF and Hokkaido researchers established the present cooperative effort. The two groups thus will avoid costly duplication and collect much more scientific information.

Seek Marked Salmon

The main task of 2 research vessels will be to collect young sockeye salmon migrating seaward through the Bering Sea. Researchers hope to find some salmon bearing fluorescent marks. These will represent part of over 750,000 young salmon marked earlier this summer on the Wood and Naknek Rivers, before starting their long ocean journey. Their recapture will give BCF biologists valuable information on migration routes. By using 2 research vessels, BCF and Hokkaido biologists will be able to gather data from a much wider area in Bristol Bay. Once the information is analyzed, the scientists will exchange findings.

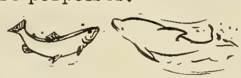
BCF Conducts Tuna/Porpoise Survey in Eastern Equatorial Atlantic

A BCF Biological Technician is exploring the eastern equatorial Atlantic to gather information on the association of tuna with porpoise. His prime interest is sampling the virtually unfished porpoise populations of the Atlantic for comparison with data from the eastern Pacific. In the Pacific, tuna and porpoise frequently school together. The schools are located by sighting the jumping or "spinning" porpoise.

Porpoise caught in purse seines in attempts to catch tuna are released by fishermen.

The Operation

Traveling with a commercial tuna seiner, a transshipment vessel, and a scouting helicopter, the technician will observe and photograph their operations. He also will collect tuna length frequency data, tuna blood samples, stomach contents of tuna, size and sex data on the porpoise catch, and photograph and measure porpoises.



Financial Aid Provided for Fishing Vessels

The Federal Fisheries Loan Fund program, administered by BCF, began in 1956. Through June 30, 1969, BCF had received 2,259 applications for $62,783,447. Of these, 1,187 ($29,002,714) were approved; 685 ($16,859,072) were declined or found ineligible; 349 ($12,585,271) were withdrawn before processing; and 38 ($1,904,505) were pending.

As 418 were approved for smaller amounts than applied for, the total was reduced by $2,431,885.

Mortgage Insurance Program

BCF also administers the Fishing Vessel Mortgage Insurance Program. Since the program began on July 5, 1960, 240 applications for $31,837,977 have been received. By June 30, 1969, 199 for $24,198,828 had been approved, and 11 for $4,262,401 were pending.

Fishing Vessel Construction Subsidies

The first applications for fishing-vessel construction subsidies under the expanded program were received in December 1964. By June 30, 1969, 119 applications for an estimated $32,191,100 had been received. Sixty were approved for an estimated $14,732,000. Thirty-two, for $18,604,748.70, have been executed. Some provide for greater subsidies than were estimated.

U.S. and 9 States Discuss Control of Water Pollution

The first in a series of meetings between Federal and State officials to coordinate plans for water pollution control was held August 6 in the offices of Carl L. Klein, Interior Department's Assistant Secretary for Water Quality and Research.

Interior Secretary Hickel said: "We are going to do everything we can to clean up the Nation's waterways. In working towards this goal, we intend to establish a close coordination and correlation between State and Federal policy making on this vital issue."

National Problem

The first group of conferees included representatives from New Jersey, Pennsylvania, Illinois, New York, Colorado, Washington, South Carolina, Vermont, and Nebraska. No attempt is being made to arrange the meetings along regional lines. The problems being discussed concern the whole country and cover the future of water-pollution control. These include regulation of thermal pollution, coastal waste disposal, deep well disposal, the "highest practicable treatment" of wastes, and Federal-State problems generally.

Record Run of Spring Chinook in Columbia River

A record run of spring chinook was tallied over Bonneville Dam this year--174,143 fish. Although the run was quite strong, there were some difficulties. Some fish were killed, probably from the high nitrogen content caused by spillway discharges at various dams on the Columbia. Because of the high nitrogen values, it was impossible to assess accurately the loss to either adults or seaward migrants. However, both juvenile and adults were noted in distress at various points along the river.

Lewiston Dam Escapement

Escapement of spring chinook over Lewiston Dam into the Clearwater River, Idaho, had exceeded 2,600 fish by June 30. They had passed through the 2 fishways rebuilt under the Columbia River Fisheries Development Program. The return was from eyed eggs planted in incubation channels in the Selway River; this was a cooperative effort of BCF and the Idaho Fish and Game Department.

Fall Creek Run

The spring chinook run was heavy in Fall Creek, a tributary of the Willamette River. By June 19, 4,001 adults had been trapped at Fall Creek Dam. In contrast, the total 1968 Fall Creek chinook count had been only 80 fish. Because of concern about saturation of spawning areas in tributaries above the reservoir, trapped chinook were being transported to Green Peter reservoir in the South Santiam River.

Bonneville Hatchery To Be Enlarged

The U.S. Corps of Engineers will finance enlargement of Bonneville Hatchery to compensate for the flooding of spawning grounds by John Day Dam. The new hatchery, sized

at 66 ponds, will have a complete reuse-water system capable of heating and chilling the water.

The Corps also has installed stoplogs in the draft tube unwatering slots at Lower Monumental Dam. This has alleviated the problem of fish entering the skeleton bays and becoming entrapped. Fish passage now is considered good.

Columbia River Water Temperatures Predicted

Exploratory temperature tests of the Columbia River have been completed by the Corps of Engineers Hydraulic Laboratory, Bonneville, Oregon. A physical model of the lower Columbia was used to determine the physical characteristics of heated discharges from a proposed thermonuclear plant near the Kalama grain dock.

Methods & Results

The dispersion characteristics of the temperature plumes were measured and recorded with Rosemount temperature sensing and recording devices. The dye plumes were recorded visually. The temperature plumes were photographed with an infrared optical system. Cursory examination of the data indicated that: (1) dye plume factors do not necessarily coincide with temperature plume limits, (2) heated water can become trapped in eddy areas, and (3) under all conditions, a temperature increase was recorded at Coffin Rock, 5 river miles downstream from Kalama, the site of another thermonuclear plant.

Tests with Fish

In other tests, juvenile salmonids were subjected to lethal temperature for a sublethal period. The treated fish were mixed with a like number of untreated control fish and placed in a large tank containing predators. The test was terminated after 2 hours. Twenby-eight of 60 treated fish had been eaten, compared with only 1 of the 60 untreated fish.

Seattle Gets Ready for FISH EXPO '69

One of the world's largest fishing shows, FISH EXPO '69, is scheduled to open in the Seattle, Wash., Coliseum on October 5. It will run 4 days. The show will feature marine exhibits, well-known speakers, panel discussions and seminars, 3 banquets, and sightseeing tours and activities.

Dr. Richard Van Cleve, University of Washington School of Fisheries and seminar program chairman, has announced this schedule:

Mon., Oct. 6, 1969

9:30-10:45 a.m. - The Electronic Detection of Fish--chaired by Dr. Murphy, director, Division of Marine Resources, U. Washington.

11:00 a.m.-12:30 p.m. - The Captains Speak Out--featuring representatives from South America, Europe, Canada, the U.S. West Coast, East Coast, and Gulf Coast.

Tues., Oct. 7

9:30-10:45 a.m. - Quality Control Ashore and Afloat--chaired by Dr. Pigott, U. of Washington.

11:00 a.m.-12:30 p.m. - The Lay System (share system in the boats)--chaired by Mr. Sig Jeager; will include representatives from each coast.

Wed., Oct. 8

9:30-10:45 a.m. - Transportation and Marketing of Fresh Fish and Shellfish--expansion of markets through air transportation, containerization of fish--chaired by Roy Stevens.

Tentative tours have been set:

Mon., Oct. 6--Open House about noon at Fishermen's Terminal aboard BCF's 'Miller Freeman.'

Tues., Oct. 7--New England Fish, Marco, and other industry points of interest in Seattle area. Morning and afternoon.

Wed., Oct. 8--U. of Washington School of Fisheries and BCF's Montlake Laboratory. Morning and afternoon.

Buses will shuttle from Center Coliseum to tour points.

FISH EXPO '69 is the third in a series. The previous 2 were held in Boston, Mass.

Fraser River Salmon Outlook Is Promising, Commission Believes

The outlook for the sockeye and pink salmon in the Fraser River system of British Columbia is promising, states the 1968 annual report of the International Pacific Salmon Fisheries Commission. The Commission was appointed under a Canada-U.S. Convention to protect and expand these resources. Its recommendations are important to Canadian and U.S. fishermen.

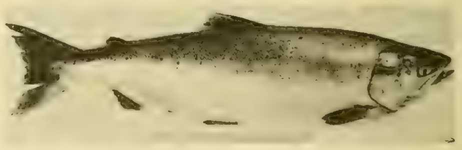
The Commission's study of the salmon fisheries of 2 other major river systems on the Pacific coast--California's Sacramento-San Joaquin River system and Washington State's Columbia and Snake Rivers--"leads to an optimistic forecast for the future of the Fraser River salmon fishery."

The Sacramento-San Joaquin River system, once a major producer of chinook salmon, lies in semi-arid, very valuable, farm land. The available river flow is being developed to full capacity, for irrigation primarily, but also for domestic and industrial water supplies. The fishery has suffered. The Fraser River watershed, in contrast, enfolds only a limited amount of farm land that needs extensive irrigation. In this respect, only a major diversion of the Fraser River to other areas would threaten the salmon fishery.

The Columbia River salmon, too, "has declined substantially." Decades ago, irrigation development "destroyed or permanently decimated" the salmon population of major tributaries. More recently, the main Columbia and Snake Rivers have been utilized for hydroelectric power. The salmon of the upper Columbia and Snake Rivers "are now declining in abundance and may eventually become of little commercial importance." Protecting the Fraser system is the policy of the British Columbia Government. It has opposed development of the Fraser's hydroelectric capacity until there are improvements in thermal generation of electric power. So the Commission concludes: "From this we gain confidence that the salmon industry of the Fraser River will not be affected by the disastrous forces which are impairing or have destroyed major salmon producing areas in the Columbia and Sacramento-San Joaquin Rivers." This policy is "all-important to the future of the fishery."

HISTORY OF FRASER SALMON

From 1911-1913, railroad construction produced an obstruction at Hell's Gate, northeast of Vancouver, B.C., which had a "devastating effect" on the annual upstream migration of Fraser River salmon. Annual sockeye production dropped 87% from an average 9.5 million sockeye for 1899-1913 to 1.2 million for 1921-24. Beginning in 1913, the extensive pink salmon escapements above Hell's Gate disappeared. The abundance index of this species declined 76%.

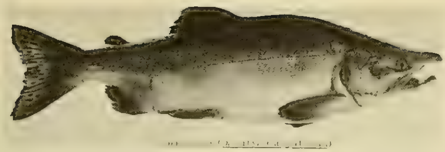


The serious effects of Hell's Gate obstruction led to the Sockeye Salmon Fisheries Convention ratified by Canada and the U.S. in 1937. The International Pacific Salmon Fisheries Commission was created "to protect, preserve and extend the fishery for this species." After 8 years of scientific study, the Commission took on regulatory responsibility. In 1945, the major Hell's Gate fishways were completed. The next year, new regulations became effective to adjust fishing "in the interest of conservation and division of the catch."

Production History--Fraser River Sockeye			
Years	Average Annual Catch	Value to Fishermen	Processed Value
		1968 Prices	
1898-1913	9,494,000	$22,008,500	$39,115,000
1921-1924	1,213,000	2,812,000	4,997,500
1958-1961	4,770,000	11,058,000	19,653,000

The years 1958-1961 are used to show current production because bad environmental conditions during 1962-1966 reduced temporarily the production of sockeye and pink salmon. Since 1966, the Commission reports, "reproductive environment and survival rates appear to be regaining favorable levels, but a full quadrennial cycle has not been completed."

Fraser River pink salmon runs also declined seriously after the Hell's Gate slide--"but have recently begun to return to their



former abundance." It has been estimated that the 1967 pink salmon catch, worth $6,380,000 to fishermen and $18,676,000 in processed value to Canada and U.S. at 1968 prices, eventually can be doubled and perhaps tripled. The escapement above Hell's Gate is increasing to large levels again and the potential production may be achieved "in a few cycle years of favorable survival rates."

When the values for sockeye and estimated minimum values for pink salmon (twice 1967 production) are combined, the original populations before the 1913 disaster were worth an estimated $28,389,000 a year to fishermen--and $57,791,000 after processing to Canada and U.S. based on 1968 prices. Immediately after the 1913 slide, the industry's value dropped to $4,950,000 to fishermen and $11,254,000 processed; it has recovered "due in a large part to the operations of the Commission." Now, annual value is $14,248,000 to fishermen and $28,991,000 after processing--an annual increase of $9,298,000 and $17,737,000 over the previous period.

Restoring Fraser's Original Wealth

Several factors will determine whether Fraser River will regain its original sockeye and pink salmon wealth. Some transplants may be necessary because, in some cases, "the original racial structure of the populations was destroyed." A second factor is "the change in the reproductive environment brought about by logging of the watershed." Only artificial aids can prevent some declines. The Commission has investigated artificial spawning channels, incubation channels, temperature control, and artificial rearing. "These artificial aids will act not only as substitutes for lost or damaged spawning grounds, but also as potential methods for extending the populations to levels greater than those possible under natural conditions."

The Commission believes that "the rehabilitation picture may change within the next two years." More data on returning adults will justify the rapid expansion of artificial aids to sockeye and pink salmon reproduction.

SOCKEYE SALMON FISHERY

The 1968 run of Fraser River sockeye entering Convention waters was 2,559,301 sockeye: 1,805,962 caught commercially, an estimated 124,002 by Indians, and 629,337 recorded on spawning grounds. Another 355,000 fish were caught in Johnstone Strait. The commercial sockeye catch was much larger than the brood year catch in 1964 of 1,023,000.

Of the 1,805,692 sockeye, Canadian fishermen caught 920,092 and U.S. fishermen 885,870--about 51% and 49%. The catch in Convention waters was 77% above that of the brood year 1964. The average weight of 4-year-old sockeye was 5.81 pounds, slightly smaller than the cycle average of 6.04 pounds.

The Canadian fishery in Juan de Fuca Strait was closed during passage of the main 1968 sockeye run because the expected run was considered too small to permit a practical fishery.

The 1968 U.S. purse-seine and reef-net fleets were the smallest of any recent cycle year. So the sockeye catch by these gear was the smallest since 1964. The gill-net fleet, with more vessels, harvested about 40% of the catch; in 1964, 35%; in 1960, 21.12%.

Escapement

The net escapement of 629,337 sockeye was 24.6% of the 1968 run to Convention waters and 21.6% of the calculated total run. Most individual escapements were higher than those in the brood year. These increases were attained mostly because of favorable marine survival of all races.

The 1968 spawning escapement "was most satisfactory and spawning conditions were generally favorable."

REHABILITATION

From 1949-1962, the Commission experimented with eyed-egg transplants to barren streams that reportedly had sockeye runs in earlier years. It achieved minor successes in beginning sockeye runs that now are self-sustaining. "However," the Commission

states, "the degree of success of these transplants has not been of major commercial importance to date," although the investment was more than justified.

The Commission studied the reasons why previous sockeye hatchery operations failed to build up Fraser River runs. It found that "hatchery-produced fry are smaller and weaker than wild fry, develop sooner and thus enter their lacustrine (growing in lakes) life earlier than normal." For these reasons, enough hatchery-produced fry did not survive to increase the returning runs. "Hovever, research by other organizations on coho and chinook salmon has shown that the adverse effects of hatchery incubation can be offset by artificial rearing of fry, with economic benefits gained in terms of adults produced."

The Commission has been forced to use artificial aids to maintain certain runs for 2 reasons: 1) increasing instability of several natural spawning grounds of pink and sockeye salmon caused by watershed logging, and 2) loss of valuable pink salmon spawning ground on Seton Creek due to hydroelectric power development.

The Commission believes that yearling sockeye smolts can be produced successfully by artificial rearing if these procedures are followed:

"Limit spring and summer rearing to self-cleaning, rectangular circulating ponds of the type developed by Roger Burrows of the United States Fish and Wildlife Service. These ponds eliminate waste products rapidly and create a uniform environment with a resulting uniformity in the distribution of fish.

"Exercise care in pond loading in respect to available space and water supply.

"Use care in all fish cultural practices, especially in the initial feeding of young fry.

"Maintain daily fluctuation in water temperature to restrict the outbreak of both bacterial gill disease and virus infection.

"Do not release the yearling fish until they are known to tolerate salt water."

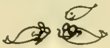
BCF Home Economist to Broadcast in Spanish

A BCF home economist will conduct a live, public-service broadcast over the Spanish-language radio station KCOR, San Antonio, Texas, on November 4. She also will tape 30- and 60-second public-service spot announcements. The tapes will be mailed to 80 Spanish-language radio stations throughout the country.

Trout Farmers Meet In October

The U.S. Trout Farmers Association (USTFA) will meet at Traverse City, Mich., October 8, 9, and 10, reports Jay N. Roundhouse, USTFA president, and convention chairman. The convention will include one day of touring trout farms and hatching facilities. The first and last days will be devoted to cultural problems and to marketing. The potential of recreational trout farming will be emphasized.

About 180 trout growers and those of allied industries and professions attended the 1968 convention. Roundhouse expects as many this year.



New Company to Publish Marine Books

A new book publishing and selling firm, the International Marine Publishing Company, has been established in Camden, Maine. The firm will supply books on such subjects as: the fishing industry, oceanography, marine photography, seamanship, and boat building. Where no published book can be provided, the company will attempt to fill the need with its own publications. The books and other products will be sold through normal retail outlets.

Three publications are now in the works--one on the history of dories and how to build them, a photographic appreciation of the Chesapeake Bay oyster industry, and a book on handling small sailing and power boats in heavy weather.

Fishery Legislation Proposed in Congress

Aware of growing public concern about the depredations of unrestrained technology on the environment, both the President and the Congress have responded constructively.

Executive Action

On May 29, the President established an Environmental Quality Council composed of himself, the Vice President, the Secretaries of Interior, Agriculture, Commerce, Transportation, Health, Education and Welfare, and Housing and Urban Development. At the same time, he established a Citizens' Advisory Committee on Environmental Quality. Its members are persons who have been serving on the now defunct Citizens' Advisory Committee on Recreation and Natural Resources.

The President said:

". . .In our time, technological development threatens the availability of good air and good water, of open space and even quiet neighborhoods. . .the quality of our American environment is threatened today as it has not been threatened before in our history. Each day we receive new evidence of the declining quality of the. . .environment.

"I am asking the Council, with the assistance of the Citizens' Advisory Committee, to examine the full range of variables which affect environmental quality. . .to review existing policies and programs, and to suggest ways of improving them. Its members must project the impact of new technologies and encourage scientific developments which will help us protect our resources.

". . .this new body must anticipate new problems even as it focuses on present ones. It is not enough that it provide answers to the questions we are asking today. It must also pose the new questions which will face us tomorrow."

House Response

More than 25 members of the House of Representatives have introduced bills and resolutions pertaining to environmental quality. They range from a resolution creating the House Committee on the Environment, to a bill that would expand the Department of the Interior and redesignate it the Department of Resources, Environment and Population.

Senate Action

At least 46 Senators have introduced or cosponsored bills and resolutions aimed at preserving environmental quality.

On July 10, the Senate considered and passed S. 1075, a bill to establish a national policy for the environment; to authorize studies, surveys, and research relating to ecological systems, natural resources, and the quality of the human environment; and to establish a Board of Environmental Quality Advisers.

The report of the Committee on Interior and Insular Affairs on S. 1075 states, in part:

"The inadequacy of present knowledge, policies, and institutions is reflected in our Nation's history, in our national attitudes, and in our contemporary life. We see increasing evidence of this inadequacy all around us: critical air and water pollution. . . the degradation of unique ecosystems; needless deforestation; the decline and extinction of fish and wildlife species. . .thermal pollution, and many, many other environmental quality problems.

"As the evidence of environmental decay and degradation mounts, it becomes clearer each day that the Nation cannot continue to pay the price of past abuse. The costs of air and water pollution, poor land-use policies and urban decay can no longer be deferred for payment by future generations. These problems must be faced while they are still of manageable proportions and while alternative solutions are still available.

"One of the major factors contributing to environmental abuse and deterioration is that actions--often actions having irreversible consequences--are undertaken without adequate consideration of, or knowledge about, their impact on the environment. . . .seeks to overcome this limitation by authorizing all agencies of the Federal Government, in conjunction with their existing programs, and authorities, to conduct research, studies, and surveys related to ecological systems and the quality of the environment. (It) also authorizes the agencies to make this information available to the public, to assist State and local governments, and to utilize ecological information in the planning and development of resource-oriented projects."

--Barbara Lundy

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OCEANOGRAPHY

Strange Buoys Thrive in Puerto Rican Waters

The crews of vessels passing 20 miles south of Ponce, Puerto Rico, can see "a weird, bright orange bud attached to a yellow stem and protected from sun, wind and rain by a white umbrella." It seems about to bloom.

"We know it's alive because we can hear a good, loud audio tone from its monitor radio transmitter and are getting positioning data on it from a high-flying satellite," reported Bob Kee, a U.S. Naval Oceanographic Office (NOO) oceanographic engineer. He helped develop and plant the exotic blossom in about 5,000 feet of Caribbean water.

Complex Buoy Array

The strange ocean flower is a complex buoy array that contains the Interrogation Recording Location System (IRLS). This system was designed to record and transmit oceanographic data to an interrogating satellite. It is supported in the Caribbean waters by an anchored subsurface buoy and a spar float.

Kee said IRLS now transmits to the satellite only a limited amount of oceanographic data--on wave heights and sea states needed to assess the array's ocean environment. The satellite is the polar-orbiting NIMBUS B II launched last spring by the National Aeronautics and Space Administration (NASA). Also, other instruments beneath the orange bud (which is a radar reflector) tell the satellite--and the scientists who later interrogate its recording and storing mechanisms--that the buoy system is well.

Array's Information

Kee explained: "We are learning how far the array's mast has tilted and how far the mast is from the water's surface as well as the direction in which its antennas are pointing--performance information that we are comparing with weather and general oceanographic data to see how well the system is working in the hostile ocean environment. The array also has instruments aboard to notify the scientists of buoy leaks and mooring cable breaks.

The Future

The present experiment is designed primarily to test IRLS' performance. It is the first phase of an idea conceived by NOO and NASA scientists to determine the possibility of using a satellite to locate and interrogate oceanographic instruments placed on platforms throughout the world's oceans.

These future platforms may be thousands of IRLS-instrumented buoy arrays. The platforms also may include ships of opportunity--Naval and commercial ships not normally equipped for oceanographic surveying. The scientists already are thinking about developing compact electronic instrument packages designed to take oceanographic measurements. These devices would be installed on the ships that travel both established sea lanes and remote, deep-ocean areas.

A Step Toward Global Ocean Forecasting System

U.S. Naval Oceanographic Office (NOO) scientists believe they now have equipment to measure wind velocities that are needed to compute "momentum flux." This flux is complex air movements that produce waves by transferring energy across the ocean surface. The equipment is a boom and 2 wind gauges strong enough, when driven into steady Trade Winds, to measure wind velocities.

The equipment was tested about 100 miles north of Barbados in the British West Indies. The results showed that it may now be possible to instal rigging and instruments designed to measure horizontal wind velocities (wind's speed and direction as it blows across the ocean) aboard Navy and commercial ships.

P. S. DeLeonibus, the cruise's chief scientist, said this capability is an important step in developing a world-wide ocean forecasting system. One day this system may operate like the daily U.S. weather-prediction network.

WHIRLING ANEMOMETERS MEASURE WIND--Two of the 4 cup anemometers attached near end of 10-meter boom extending forward from bow of GILLISS. These record horizontal wind velocities for wind-wave specialists. The measurements may help them learn how to compute momentum flux--complex air movements that produce waves by transferring energy across ocean surface.

The Equipment

"The rigging and instruments," he explained, "could be attached to ships stationed in deep ocean areas where the construction of stable platforms designed to support oceanographic and meteorological measuring devices is not possible."

This system would be based on quick computer mathematics obtained from descriptions of ocean and atmospheric conditions--recorded by instruments aboard ships and stable platforms. Forecasts resulting from this network would ensure safety of ships at sea. They also would speed passages and help fishing and mining industries to tap the ocean's riches.

Storm Surge Studied

Water not wind is the "most deadly and destructive feature of the hurricane," according to U.S. Weather Bureau experts studying coastal floods caused by storm surges along most of the Atlantic and Gulf coasts.

At ESSA's National Hurricane Center in Miami, Fla., weathermen are gathering data on every aspect of these sudden, storm-generated rises of water levels along the shore. The results, already complete for some areas, will enable forecasters to point out specific danger areas when a storm approaches the U.S.

What Storm Surge Is

The height of a storm surge can vary greatly over a relatively short stretch of coastline. This would depend on geographic features and where the storm itself is in relation to the shore. A surge of only a few feet that could flood hundreds of square miles of low-lying delta land at a river's mouth could go practically unnoticed 50 miles up the coast.

The Weather Bureau states that the classical definition of storm surge is the abnormal rise of the sea along the shore, resulting primarily from storm winds and low atmospheric pressure. However, many factors help determine.the height the surge will reach as it travels from storm center to coast. Superimposed on the normal astronomical tide and storm tide are heavy, storm-produced waves

and swells. As the storm nears shore, the storm surge can reach "incredible proportions."

The Deadliest

In 1893, a hurricane struck the Atlantic Coast between Savannah, Ga., and Charleston, S. C. A tremendous wave submerged all coastal islands around the Charleston area. It killed 1,200-2,000 persons.

The deadliest disaster in U.S. history was the 1900 Galveston, Tex., hurricane. Nearly 6,000 persons died. Most of them drowned in Gulf waters, which rose as high as 20 feet in a few hours.

In 1957, a storm surge over 13 feet high was created by Hurricane Audrey. It inundated parts of the flat Louisiana coast. In some sections, the surge flooded areas 25 miles inland. The death toll was 390.

The storm-surge data being compiled are available to local officials and civil defense agencies.

The Weather Bureau has practical advice for coastal residents threatened by the hurricane storm surge: If a hurricane "watch" or "warning" is issued, tune in radio or television for the latest advisories and bulletins from the ESSA Weather Bureau. These will include information on expected rises of coastal waters.

Gulf of Mexico Oceanographic Study Underway

Oceanographers of the U.S. Naval Oceanographic Office (NOO) are conducting an intensive 1-year shipboard probe into the oceanography of the Gulf of Mexico. They are working with geologists from the U.S. Geological Survey (USGS) aboard the USNS KANE to collect oceanographic and geological data from the Gulf. They are seeing much of their geochemical information analyzed almost as soon as they gather it.

To Dr. Charles W. Holmes, a USGS staff geologist, positive results from this combination of data-gathering and data-processing techniques "will be a breakthrough in geochemical mapping at sea by making more efficient and thus more economical surveys."

Devices Used

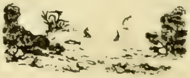
The KANE's oceanographers-analysts are using a direct-reading emission spectrometer--a device capable of simultaneously measuring 10 different chemical elements--to get an idea of how these elements are distributed throughout the Gulf sediments retrieved in coring operations. By mapping the elements' distribution, geologists can assess the economic potential of large sea-floor areas. The result may help industrialists plan exploitation programs.

Sea-Floor Elements

NOO scientists are particularly interested in understanding the distribution of elements throughout sea-floor sediments. They can use maps and analyses based on these data as guides in predicting ocean-floor geologic changes, which are needed by the Navy and the maritime community.

Survey Aims

The scientists hope the probe will clarify some historical theories on how the Gulf was formed and how it may look in the future. They want to substantiate recent data that point to more oil-producing sands than previously had been determined for offshore Gulf areas. The data also indicate the presence of high concentrations of zirconium, a heavy metal with a high melting point that can be used in alloys.



Probe Warm Eddy Near Gulf Stream

Oceanographers of the U.S. Naval Oceanographic Office (NOO) hope that analysis of temperature and salinity data collected during a recent scientific cruise in Atlantic coastal waters will help them to learn "how warm water eddies form, develop and sometimes disappear in ocean waters." Al Fisher, the survey's chief scientist, said the eddy study is part of program designed to give oceanographers working as ocean forecasters greater understanding of how temperature conditions in relatively shallow continental shelf waters fluctuate in relation to time and space.

The analyzed results will provide the Navy with wave, current, and temperature predictions.

Edge of Gulf Stream

Working about 75 miles northeast of Cape Hatteras, N.C., near the edge of the Gulf Stream, the oceanographers aboard the USNS GILLISS first pinpointed the eddy and collected their temperature data. It is a warm, highly saline phenomenon. Unlike the nearby warm Gulf Stream waters, it is limited apparently to near-surface waters.

Fisher noted: "Although we do not know exactly how a warm water eddy forms, we believe that this one may be associated with physical conditions, which may result during offshore movement of the Gulf Stream as the strong current passes Cape Hatteras."

Past attempts to locate this eddy were not always successful and the oceanographers believe it may disappear from time to time. Fisher said the eddy has been observed in the past either as "a tongue protruding from the Gulf Stream or as an independent feature."

The GILLISS Operation

As the GILLISS steamed along a grid pattern, across the area containing the eddy, the oceanographers used recording systems to obtain continuous data on water-surface temperature and salinity. They dropped expendable bathythermographs--instruments designed to record temperature as they sink to bottom--at 4-mile intervals along the grid.

The oceanographers examined the relationship between the warm eddy and the surrounding colder waters. At 19 different stations along the ship's route, they stopped the ship to lower instruments that measured continuously temperature and salinity at subsurface depths. These readings gave the scientists an idea of the eddy's structure. The readings will be used, with surface temperature, to draw a 3-dimensional picture of the phenomenon.

Air Support

To help determine the eddy's boundaries, other scientists working aboard a research airplane made remote-sensing flights over the area on 4 of the 10 survey days. Airborne expendable bathythermographs and the plane's radiation thermometer were used. The airborne scientists recorded temperature data from both surface and subsurface waters.

In-flight data analysis showed temperature fluctuations of several degrees. This allowing the scientists to pinpoint where the eddy's boundary was in relation to the surrounding cold waters. This information was relayed to GILLISS scientists, who used it to determine where to take detailed temperature and salinity measurements.

During one 5-hour period, the airborne scientists ordered it flown as low as 200 feet over the ship to compare plane instrumentation with the GILLISS'. Results of the comparison will be used to aid data analysis and to evaluate new plane instrumentation.

Marine Animals Surveyed

Both air and ship oceanographers also look for the types and numbers of marine animals in a survey area because these, like ocean conditions, can hamper transmittal of sound signals during Naval sonar ranging operations.

The scientists reported several whales and hundreds of porpoises.

U. of Washington Sponsors S. American Oceanographic Tour

The University of Washington is sponsoring a South American study tour in oceanography, Jan. 16-Feb. 8, 1970. The tour will travel by air, sea, and land from San Diego, Calif., to the Galapagos Islands, Punta Arenas, Trinidad and Tobago, and intermediate points of interest.

It will be conducted by University oceanographers and local biologists and geologists for laymen--and offer "on-site observation and study of intertidal and near-shore environments, tropical marine biology, coastal engineering, coral reefs, volcanoes, beaches, and fjords."

For information: University of Washington, Office of Short Courses and Conferences, 327 Lewis Hall, Seattle, Wash. 98105.

Foreign Fishing Off U.S. in June

Bad weather reduced surveillance in the Northwest Atlantic in June. About 146 foreign fishing and support vessels were sighted, 25% fewer than the 201 sighted in May.

OFF SOUTHERN NEW ENGLAND & GEORGES BANK

Soviet: One hundred and forty vessels--28 factory stern trawlers, 96 medium side trawlers, 6 factorybase ships, 9 refrigerated fish transports, and 1 tanker were sighted. (In June 1968, 103 had been sighted.)

Fig. 1 - Soviet fishing off southern New England and on Georges Bank in June 1969; includes number of vessels and species caught.

Polish: Two stern trawlers and 1 side trawler were sighted.

Bulgarian: The factory stern trawler 'Flamingo' was sighted off southern New England in May, and again in June. Late in June, the stern trawler 'Bekas' joined her about 30 miles south of Martha's Vineyard. Catches reportedly were herring and mackerel.

Fig. 2 - Bulgarian stern freezer trawler 'Flamingo' fishing off New England.

Greek: The trawler 'Paros' had been fishing on Cultivator Shoals, Georges Bank since early May and, by June 23, had caught about 235 metric tons-- ⅓ her 700-ton capacity. Catch was 94 tons of cod, 58 tons of flounder, 27 tons of haddock, 40 tons of herring, scup, and mackerel, and 16 tons of other species.

MID-ATLANTIC, SOUTH ATLANTIC & GULF OF MEXICO

No foreign fishing vessels reported.

OFF PACIFIC NORTHWEST

Soviet: Sixty-five vessels were sighted--31 stern and 10 side trawlers fishing hake, 9 vessels whaling, 3 conducting fishery research, and 12 support vessels. By mid-month, nearly all except the whalers were off south Washington coast. (In June 1968, 83 vessels including 43 stern trawlers had been sighted.)

The whaling fleet was off south Oregon. Ten whales were seen being towed by a factoryship, parts of 4 were on deck, and 8 were buoyed and flagged in vicinity of catcher boats.

Japanese: No vessels sighted. (In June 1968, 3 stern trawlers had been reported.)

OFF ALASKA

Soviet: From 20 to 25 vessels were sighted, about the same as in May 1969 and June 1968.

In the ocean perch fishery, 1 to 3 factory trawlers fished along the 100-fathom curve in the Gulf, and 3 to 12 factory trawlers, 3 medium trawlers, and 1 refrigerated carrier were along the Aleutians.

About 10 trawlers and 1 refrigerated carrier fished pollock, sablefish, arrowtooth flounder, and rockfish northwest of the Pribilofs, off Shelf edge in central Bering Sea. About 2 medium trawlers were northwest of Unimak Pass in eastern Bering Sea.

Japanese: Vessels increased from slightly over 400 in late May to 530 by late June.

In the ocean perch fishery, 2-12 stern trawlers and 1 refrigerated transport fished in the Gulf, 2 to 6 stern trawlers were along Aleutians, and 15-20 independent stern trawlers, and at least 2 refrigerated transports were along Shelf edge in eastern and central Bering Sea.

Five factoryship fleets in the Bering Sea trawl fishery for Alaska pollock and flatfishes to be used for minced fish meal, meat and oil centered on the Shelf edge in the Bering Sea, northeast of the Pribilofs.

By late June, 8 high-seas salmon fleets were in central Bering Sea, 2 were around Attu in western Aleutians, and another was south of western Aleutians, out of Alaskan area.

The Bering Sea herring fishery--2 factoryships, 40 gill-netters, and 2 cargo vessels--ended after first week, when 2 vessels were apprehended for fishing in U.S. contiguous zone.

South Korean: Seven small trawlers, 1 factoryship, and 2 refrigerated transports fished on the Shelf, northeast of the Pribilofs, close to the Japanese minced-fish-meat-and-meal fishery. Catches primarily were Alaska pollock. A larger stern trawler operating independently also fished pollock in the same area.

Late in June, 5 gill-netters and a refrigerated transport began fishing salmon in outer approaches to Bristol Bay, north of Alaska Peninsula. Catches were mature sockeye salmon on their way to Bristol Bay.

STATES

Alaska

1964 ALASKAN QUAKE MOVED MOUNTAINS, SHIFTED ISLANDS

The force of the 1964 Alaskan earthquake shifted islands, moved parts of vast mountain ranges horizontally 50 feet, and sank some mountains almost 10 feet. This has been reported by ESSA's Coast and Geodetic Survey.

The Good Friday earthquake was the strongest ever recorded on the North American continent. The seismic sea wave that followed caused 131 deaths and over $750 million damage. Scientists still are assessing the effects.

Book Contains Findings

Some of their findings are reported in the third volume of "The Prince William Sound, Alaska, Earthquake of 1964 and Aftershocks," prepared by the ESSA agency. This volume contains research studies and interpretations in geodesy and photogrammetry.

Among the findings are:

1. The Chugach and Kenai Mountains, about 80 miles from Anchorage in southeastern Alaska, shifted southward about 50 feet.

2. The mountain masses south of Portage subsided 9.84 feet.

3. Three islands in Shelikof Strait--Ushagat, Afognak, and Kodiak--shifted to east and south.

4. Montague Island, at edge of Prince William Sound, the earthquake center, was lifted over 30 feet. This unpopulated island, about 50 miles long and 10 miles wide, was tilted: one side rose more than 10 feet above the other, and shifted its position 40 to 50 feet.

5. The Matanuska Valley settled about 1.6 feet.

6. The earthquake was so strong and followed by so many aftershocks that "the earth's crust was fractured in many different forms throughout the entire region."

7. The ocean floor between Kodiak and Montague Islands rose about 50 feet, the greatest uplift ever recorded. Gravity studies indicated "a massive intrusion of magma" (molten rock from within the earth) caused the uplift.

Findings Based on 1964-68 Surveys

The findings are based on 1964-68 surveys. Scientists emphasized that the findings were relative. No one could be absolutely sure of what happened. But the findings were based on painstaking surveys by geodetic, photogrammetric, and hydrographic field parties.

Charles A. Whitten, the Coast Survey's chief geodesist, analyzed the movement of mountain ranges and islands. He stated: "The resurveys have indicated that the Chugach Mountains (which are south of the Matanuska River), the Kenai Mountains, and the islands in Prince William Sound have all shifted to the south."

He added that the shift began "with a slight elongation across the Matanuska Valley, accumulating to a maximum of the order of 15 meters (50 feet) for the southeastern slopes of the Kenai Mountains, Montague Island, and the nearby regions extending into the Gulf of Alaska."

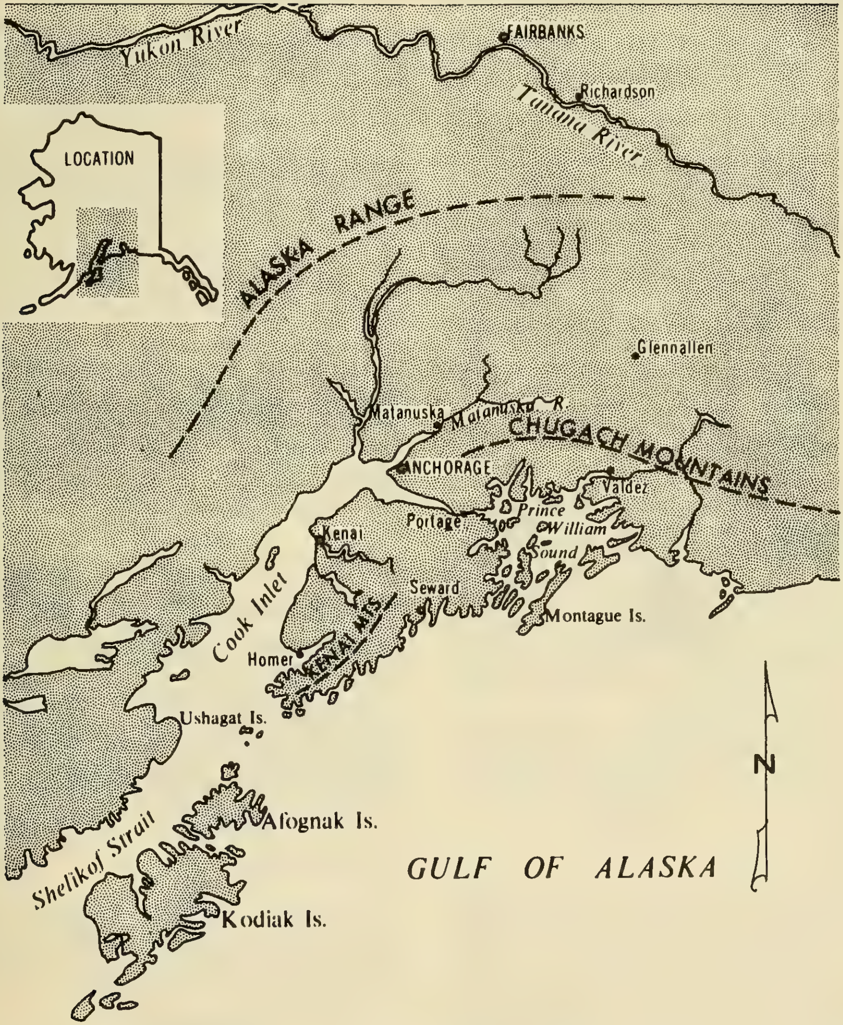
Whitten continued: "Repeat surveys made in 1967 across Shelikof Strait show that Ushagat Island, Afognak Island, and Kodiak Island have been displaced to the east and south with a direction that is fully related to the displacement of the Kenai Mountains."

He said the maximum movement occurred between Homer Spit and the south side of the Kenai Mountains, a distance of less than 50 miles.

Other findings:

1. The maximum earth subsidence from Glennallen towards Fairbanks was 7 feet. In the Alaska Range along the Richardson Highway, an upheaval of .3 to .8 foot occurred.

2. From Matanuska to 15 miles southeast of Fairbanks, maximum subsidence was 1.9 feet.



Vast mountain ranges moved 50 feet, some mountains sank 10 feet into the earth, and islands were shifted by force of 1964 Alaskan earthquake, according to new findings of tremor's effect recently made public. Drawing depicts area hit hardest by strongest earthquake ever recorded on North American continent.

3. In general, subsidence from Seward to Anchorage ranged from 2.3 to 6.2 feet. From Anchorage to Matanuska to Glennallen, the subsidence ranged from .167 foot to 5.1 feet.

The new earthquake volume can be purchased from Government Printing Office, Washington, D. C. 20402, for $4.25.

* * *

SEA LIONS OBSERVED ON AN ALEUTIAN ISLAND

Two BCF scientists observed Steller sea lion rookeries on Ugamak Island in the Aleutians from June 3-21. Ugamak, on the southwest approach to Unimak Pass, is part of the Aleutian National Wildlife Refuge. The rookeries are heavily populated in June, when the pups are born. The scientists estimated that there were more than 15,000 sea lions around the island. Storms cause a substantial loss of pups from rookeries on steep beaches.

Prepare for Future Study

The scientists also established counting and photographic stations, and access routes to rookeries, in preparation for a proposed future sea-lion population and behavior study.

California

FASTER ANCHOVY AGE ANALYSIS DEVELOPED

New procedures for age analysis of anchovies have been established by scientists of the California Department of Fish and Game and BCF.

Otoliths to be Used

Otoliths and scales are equally usable for anchovy age determination. Otoliths will be used because they are available from all fish, while scales often are missing from a high percentage. The time required to clean and mount scales between glass slides also will be saved because otoliths are read without mounting. The samples collected during each quarter of a year will be divided equally among 4 readers; quarterly summaries will be compiled.

Check Systems Devised

Routinely, each pair of otoliths will be read only once. But, to insure that all 4 readers continue to read alike and to detect changes in reader accuracy, 2 check systems have been devised. During a quarter, each reader will receive at least one sample read by another to compare their readings. The second test will be a standard set of otoliths covering all age-classes on which all readers have agreed. Periodically, this standard set, labeled like a routine sample, will be sent to each reader.

* * *

CATFISH FARMS IN IMPERIAL VALLEY AROUSE INTEREST

The establishment of Imperial Enterprises with about 300 acres of catfish ponds has created considerable interest in California's Imperial Valley. About 380 acres are under production and 500 more are planned. Almost ideal conditions exist in water, soil, and temperatures. Until now, most sales have been to catch-out ponds, but interest is developing in restaurant and market outlets.

Massachusetts

GLOUCESTER-BASED SHRIMP FISHERY IS DEVELOPING

A new shrimp fishery based in Gloucester, Mass., may develop into a year-round operation. There are now 7 vessels in the fishery. Trucks haul the catch from Gloucester to Boothbay Harbor, Maine, for processing. However, a shrimp plant is expected to be opened in Gloucester within a few months.

Shrimping Good

The fishing has been surprisingly good. Several vessels have landed 15,000 pounds from 1- to 2-day trips. New England shrimp fishing has been mainly a winter operation, primarily out of Portland, Maine.

Oregon

PORTS CLOSED TO CALIFORNIA-CAUGHT SHRIMP

On August 5, the Oregon Fish Commission closed Oregon ports to landings of pink shrimp caught off California. The California Department of Fish and Game had closed California ports earlier.

The small pink shrimp, widely used in seafood cocktails, are harvested from large beds off Washington, Oregon, and California. The California bed is limited in size and intensively managed. California Department of Fish and Game biologists set a quota annually for the harvest. When the quota is reached, the bed is closed to further fishing, leaving a brood stock to replenish the bed. The 1969 quota of 3 million pounds was expected to be reached on August 2.

The Oregon Fish Commission action only prohibits landings of shrimp caught south of the Oregon-California border. It does not apply to shrimp taken off Oregon.

Texas

ADVICE FOR STOCKING FARM PONDS

New farm ponds should not be dumps for any kind of fish, asserts Fred G. Lowman, supervisor of freshwater fisheries in Waco for the Texas Parks and Wildlife Department. Special attention should be given to species and numbers. New impoundments should be stocked with the kinds of fish the owner or operator wants to catch or use.

It is very important to restrict the number to what the water will be able to support. Lowman emphasizes that it would be futile to place balck bass in a farm pond if no one in the area fished these. The same is true of other species.

Catfish Before Black Bass

When bass and channel catfish are going to be put in a stock tank, the best results may be expected when the catfish are introduced in the fall--before releasing the black bass the following spring. Bass stocked in farm ponds in the spring often grow large enough by fall to consume most catfish, or other fish stocked at the same time.

Lowman says people hurt their chances for good fishing when they release fish of varying sizes and species.

* * *

PORT OF HARLINGEN FISH KILL DUE TO PROLONGED POLLUTION

The recent estimated kill of 5 million fish in the Arroyo Colorado and the Port of Harlingen was due to a "natural" form of pollution, report biologists of the Texas Parks and Wildlife Department. They explain that hydrogen sulfide, created by decaying organic matter, settles to the bottom and accumulates until the water is disturbed. Low tides and the disturbance caused by propellers of boats and ships caused this gas to circulate through the water and kill fish.

Of the 5 million, over 99% were menhaden, the remainder small noncommercial fish.

ARTICLES

GROUNDFISH SURVEY PROGRAM OF BCF WOODS HOLE

Marvin D. Grosslein

Otter trawl surveys of groundfish populations in New England waters have been conducted from time to time over the last 20 years by BCF's Biological Laboratory at Woods Hole, Massachusetts. The frequency and scope of these surveys increased markedly after acquisition of the new research vessel 'Albatross IV' in 1963. Nine surveys in 1963-65 represented 3 seasons each year and covered the Continental Shelf out to a depth of 360 meters (200 fathoms), from Long Island to western Nova Scotia. This was about 60,000 square miles. In 1967, the survey area was extended south to Cape Hatteras, N. C., in response to increasing concern over foreign exploitation of the stocks of fish in the Middle Atlantic Bight (Fig. 1). The total survey area now covers nearly 75,000 square miles. It is being covered twice a year, one cruise each spring and fall.

Principal objectives of the survey program are:

1. To monitor fluctuations in structure and size of fish populations--to provide a measure of the effects of fishing that is independent of commercial fishery statistics.

2. To assess the fish production potential of Atlantic coastal waters.

3. To determine environmental factors controlling fish distribution and abundance.

4. To provide basic ecological data on fishes (e.g., growth rates and food) necessary to understand interrelationships between fish and their environment.

METHODS

Routine Data Collected

Routine data recorded for each survey trawl haul include length frequency and total weight of every fish species in the catch--and invertebrates such as lobsters, shrimp, scallops, and squid. Scales or otoliths are also collected routinely for several important groundfish species to estimate age composition, and from this information, mortality rates. Water temperature profiles from surface to bottom are taken routinely throughout the region. Since 1968, fish eggs and larvae have been sampled with plankton nets down to 50 meters simultaneously with otter-trawl hauls. A wide variety of other kinds of data is also collected. This depends on available personnel and needs of individual investigators within and outside BCF.

Machine Processing Methods Developed

So far, only preliminary analysis of part of the survey data has been possible. The minimum routine information collected on a single cruise represents a formidable quantity of data, and comprehensive analysis requires automatic data processing (ADP) methods. Development of ADP capability at the Woods Hole Laboratory has now reached a point where, for the first time, it is feasible to begin an adequate analysis of the basic survey data--past and present.

Sampling Design Tailored to Objectives

One prerequisite for successful monitoring of changes in fish abundance is an objective measure of the precision of the abundance index: that is, the sampling error of the average catch per haul of the research trawl. This requirement, plus consideration of the nature of groundfish distribution, led us to adopt a stratified random sampling design for the surveys. The entire area from Cape Hatteras to western Nova Scotia is now subdivided into 58 sampling strata; their boundaries were selected chiefly on the basis of depth--which is known to be correlated with groundfish distribution (Fig. 2). Trawl stations are

The author is a Fishery Biologist, BCF Biological Laboratory, Woods Hole, Mass. 02543.
Note: Figs. 5, 7, 8, 9, and 10 are in the appendix in reprint (Sep. No. 846) of this article. For a free copy of the Separate, write to Division of Publications, U.S. Department of the Interior, Fish and Wildlife Service, BCF, 1801 N. Moore St., Arlington, Va. 22209.

U.S. DEPARTMENT OF THE INTERIOR
Fish and Wildlife Service
Sep. No. 846

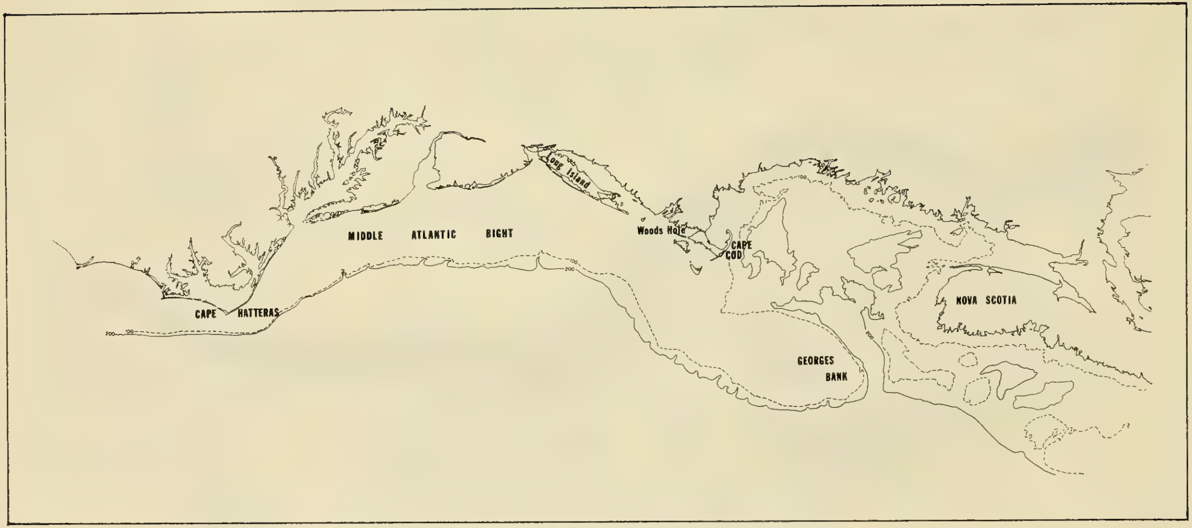


Fig. 1 - Atlantic region in which otter-trawl surveys are being made twice yearly by BCF Biological Laboratory, Woods Hole, Mass.

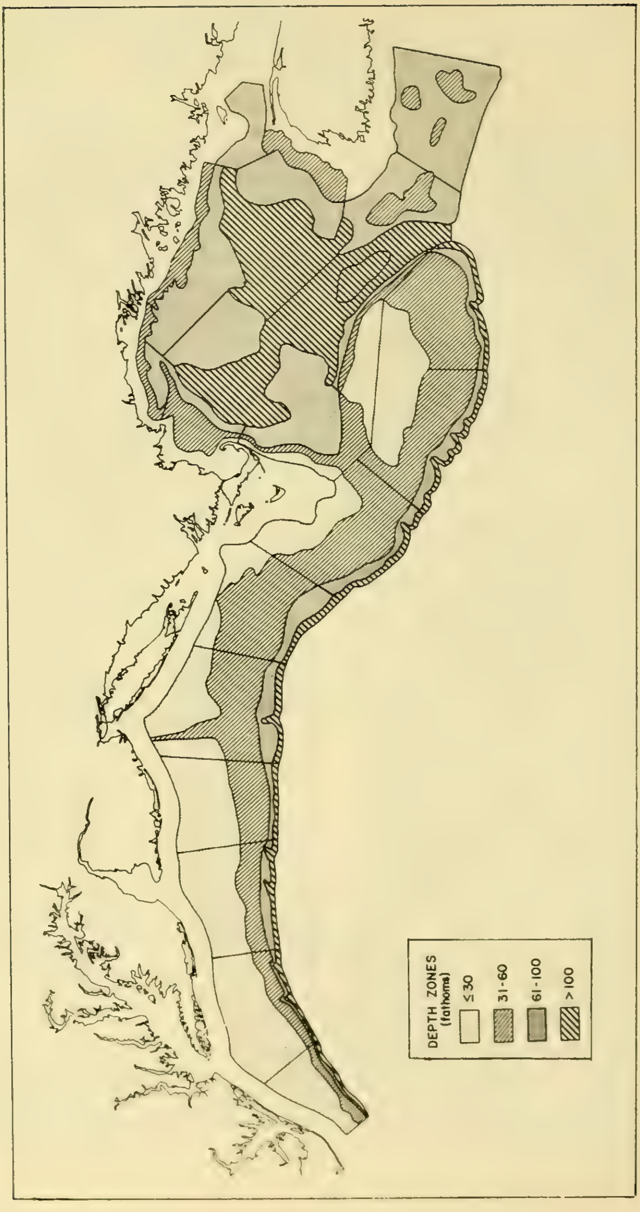


Fig. 2 - Sampling strata used on groundfish surveys with Albatross IV.

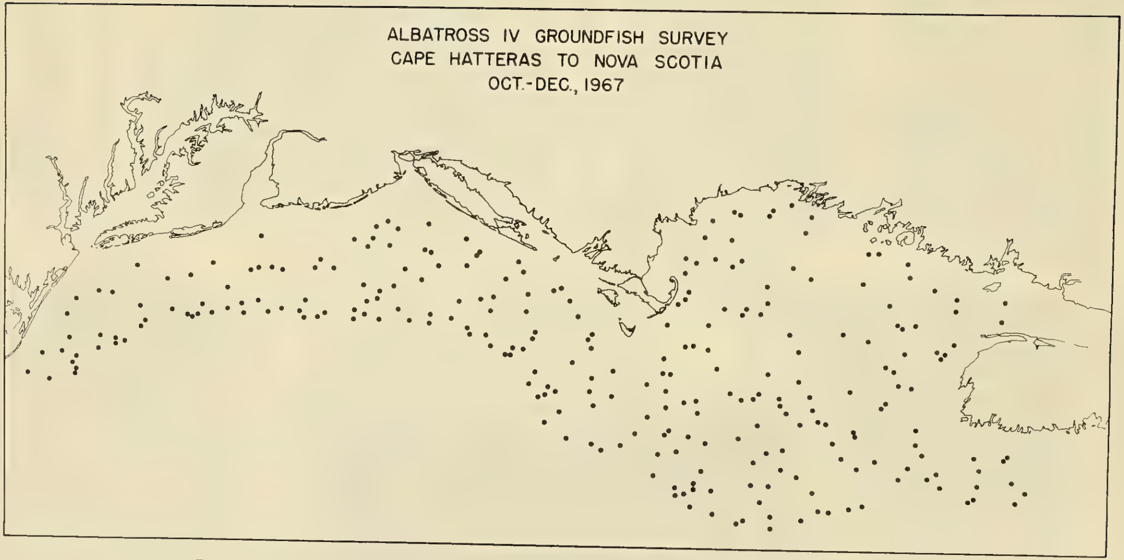


Fig. 3 - Pattern of 272 otter trawl stations occupied by Albatross IV on 1967 fall groundfish survey.

randomly located within each sampling stratum. A typical station pattern is shown in Fig. 3.

This sampling scheme provides fairly uniform distribution of stations throughout the survey region and insures some trawling in every depth zone in all geographic subdivisions. At the same time, random sampling within each stratum obtains valid estimates of the sampling error variance of the abundance indices. The indices are unbiased (representative of the stratum) in the sense that every habitat type is sampled with probability proportional to the area covered by the habitat within each stratum. Preliminary analysis indicates that, with our present design and sampling intensity, the statistical confidence intervals around our abundance indices are sufficiently small to provide a new capability in monitoring fluctuations in groundfish stocks.

Advantages of Research Vessel Data

Relative abundance indices should have small sampling error; it is even more important that they reflect faithfully changes in true abundance of the fish population. Commercial fishing practices change in response to market demand as well as fish availability. And availability from a commercial standpoint may be more closely related to the degree of aggregation of fish than to the absolute abundance. In addition, technological improvements in commercial trawls and fish detection gear occur from time to time. These increase fishing power in a manner very difficult to measure. Research vessel abundance indices are free of these biases because they are based on a standardized fishing method (30-minute haul with a standard survey trawl) and because trawling is done at randomly preselected locations.

Other important advantages of research vessel surveys are synoptic coverage and completeness of catch records. The statistics of commercial landings reflect only those species and size groups suitable for market in a particular port at a particular season. Within any one season, a fleet usually concentrates its effort in a relatively restricted portion of its annual range, depending upon aggregation of the principal species sought. On the other hand, research vessel catches provide information on distribution and abundance of all kinds and sizes of fish available to the trawl over the entire shelf, from Cape Hatteras to western Nova Scotia, within a period of 6-8 weeks.

Rapid and complete coverage of the survey area at specific seasons of the year, as well as over a period of years, is necessary if we are to make real advances in understanding the magnitude and causes of fish movements. It is equally important to monitor the general structure or species composition of the groundfish community. Replacement of heavily exploited desirable species by their unexploited competitors is a possibility that must be considered in any rational long-term management plan. Our surveys are providing "ecological benchmarks" against which future changes in the fish community can be compared.

Distribution and abundance of juvenile fish are other important kinds of information obtained from surveys. Small fish are retained by a fine-mesh liner in our survey trawl. The data on precommercial sizes are necessary to study recruitment; they are useful for making short-term predictions of future abundance. These predictions are rapidly becoming essential as we enter an era of management of international fisheries by national catch quotas.

Trawl Efficiency--A Critical Problem

Trawl efficiency, the ability to catch desired species in desired quantities, imposes the principal problem in interpreting research trawl catches. Ideally, we would like the research trawl to catch all organisms within a specified range of size, in some known proportion to their absolute numbers under a unit area of sea surface. This would give a direct estimate of an identifiable segment of total biomass. Of course, this is not possible. At present, we must settle for some unknown proportion (varying widely for different species) of organisms present in the path of a trawl, the opening of which extends only a few meters above the sea bed. To convert such trawl catch data into estimates of biomass, a great deal more must be learned about factors that determine catching power. These are:

1. Actual distribution of fish in 3 dimensions.

2. Behavior of fish in front of the trawl.

3. Performance of the trawl itself: its configuration and motion relative to the bottom.

Direct measurement of these factors will require remote sensing devices. In particular,

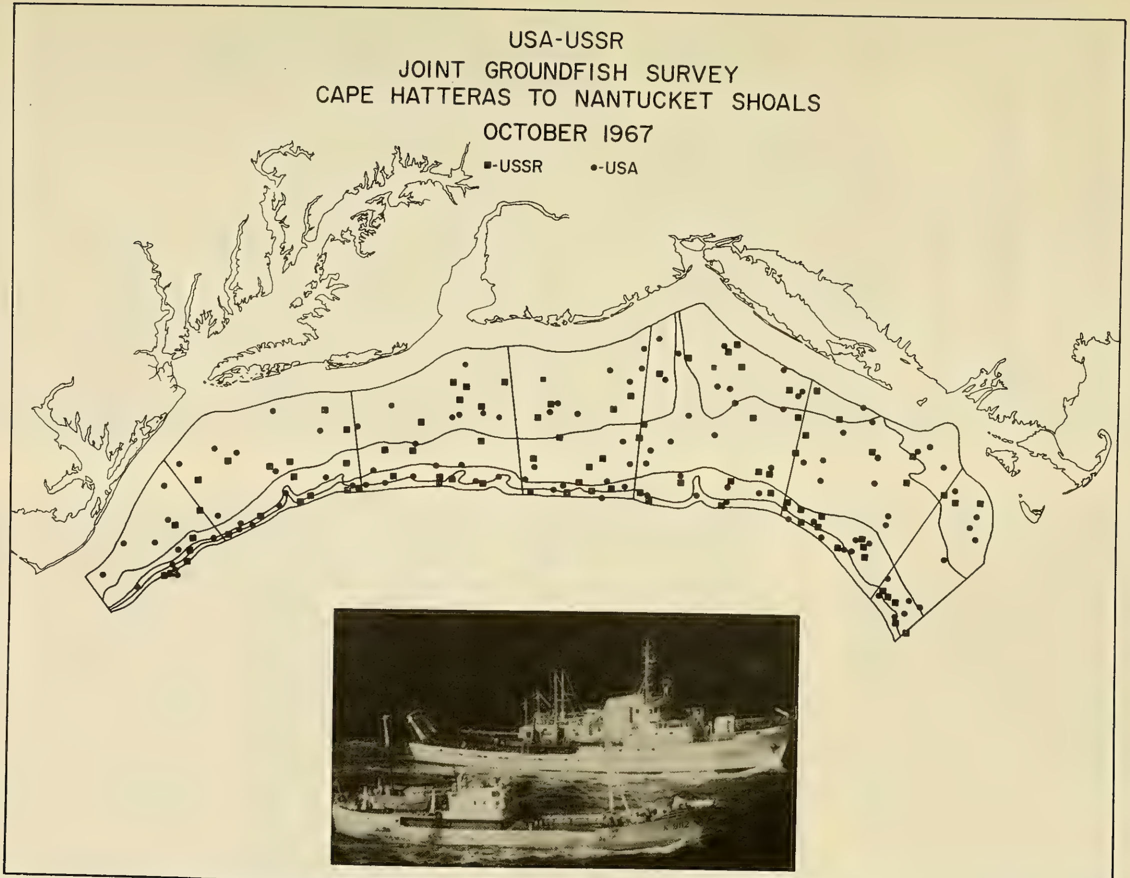


Fig. 4 - Otter trawl stations occupied by Albatross IV and a Soviet research vessel in 1967 joint groundfish survey. Albatross IV is in background (slightly ahead).

development of acoustic methods for assessing absolute abundance and distribution of fish appears to hold considerable promise. Eventually, these methods may replace trawling altogether in certain aspects of census studies. For the time being, however, conventional trawling is a necessary method for providing some information on the dynamics of fish populations here and now. It is an indispensable link with the past as revealed by trawl catch statistics--both research and commercial. Furthermore, trawling, perhaps in conjunction with photographic methods, will continue to be required for a long time in identifying and calibrating acoustic targets.

Trawl Comparison Studies in Progress

Some insight into the problem of trawl efficiency can be obtained by comparing catches of different trawls for which physical configurations are known. Studies of this nature were conducted as part of the joint cruises of Albatross IV and USSR research vessels in 1967 and 1968. These were carried out in cooperation with BCF's Exploratory Fishing and Gear Research Base at Gloucester, Mass. (Fig. 4). Biologists from state, university, and Federal laboratories in Maine, Massachusetts, New York, New Jersey, Rhode Island, Maryland, and Virginia also took part.

The first cruise (October 1967) was designed to improve our understanding of the dynamics of fish stocks in the Middle Atlantic Bight. The same area was covered in fall 1968; then it was extended to the remainder of the Albatross IV survey area (see Fig. 2).

The U.S. survey trawl was fitted with rollers (absent on the USSR trawl) on the groundrope. The headrope height and total mouth area were approximately half that of the USSR trawl. Analysis of the 1967 data has confirmed most of the expected catch differences between the trawls, which were related to the above factors. For example, on the 1967 joint survey from Hatteras to Nantucket shoals, the USSR trawl caught several times as many red and silver hake. This might be expected because of its higher headrope (silver hake are often found well off the bottom) and because it tended bottom more closely without rollers (red hake are a bottom-hugging species). The smaller U.S. trawl, however, gives essentially the same general picture of distribution and relative abundance (Fig. 5 in appendix). The final results of these joint studies, which are still being analyzed, will provide valuable data on factors affecting fishing power. The results will be a significant step toward better interpretation of our survey catch data as indices of relative abundance.

SOME PRELIMINARY RESULTS OF ALBATROSS IV SURVEYS

Predicting Fluctuations of Georges Bank Haddock

Catches of juvenile (6- to 8-month-old) haddock on fall groundfish surveys are proving a good index of the strength of incoming year classes, or broods of haddock, on Georges Bank. Normally, haddock on this bank do not reach a size suitable for the U.S. market until they are about $2\frac{1}{2}$ years old. Therefore, the juvenile haddock index provides a means of predicting the relative numbers of recruits to the fishery 2 years in advance. As yet, the index is not highly precise and factors affecting its accuracy are being studied. Nevertheless, along with research vessel catches of older haddock, the index for juvenile fish has proved invaluable in predicting and explaining recent changes in the abundance of Georges Bank haddock. This was particularly true for the drastic decline since 1965.

Research vessel surveys indicated very poor survival in 1960 and 1961, followed by moderate survival in 1962 and a bumper crop of young haddock in 1963. Brood success was poor again in 1964 and 1965. With such a series of brood years, it was expected that the fishable population (age 2+) would show some increase in 1964 with recruitment to the fishery ($4\frac{1}{2}$ inch mesh) of the moderate 1962 year class, and a substantial increase in 1965 when the very strong 1963 year class entered the landings. Abundance in terms of weight of fish available to the fishery was expected to increase still further in 1966, and possibly still more in 1967, despite the weak 1964 and 1965 year classes. This trend in abundance was expected because, under normal levels of fishing effort, the maximum weight yield of the average haddock year class on Georges Bank occurs between the ages of 3 and 4. Up until that time, growth more than compensates for mortality, both natural and fishing mortality. After that, however, total weight of the year class declines steadily as mortality more than compensates for growth.

The expected increases in total abundance for 1964 and 1965 occurred as shown in fig. 6.

Fig 6 - Haddock abundance indices (average catch per 30 minute haul with standard survey trawl) for Georges Bank from Albatross IV groundfish surveys.

Age analysis showed the increase to be due principally to the 1963 year class. The expected increases for the next two years never materialized for the U.S. haddock fleet, however, because of extremely heavy fishing by foreign fleets on Georges Bank haddock in the latter half of 1965 and in 1966. Total landings in each of those 2 years were about triple the previous long-term annual average, and large numbers of the 1962 and 1963 year classes undoubtedly were removed. A substantial proportion of the 1963 year class apparently was removed in 1965 and the first half of 1966 before full recruitment of that year class to the U.S. fishery. The effects of such heavy fishing are reflected in the precipitous drop in Albatross IV abundance indices early in 1966 (Fig. 6).

In addition to a large increase in fishing mortality generated by the sudden increase in fishing by foreign vessels, the juvenile haddock index for the 1966 year class was low: the 1967 year class index was the lowest on record. The inevitable serious decline was reflected in Albatross IV indices shown in fig. 6. Of course, it has appeared as well in the scarcity of haddock to the commercial trawlers. The 1968 juvenile haddock index also was very low. Therefore, the earliest possible improvement in haddock abundance on Georges Bank is in 1971. It will depend on the success of the 1969 spawning.

Distribution and Seasonal Movements

Surveys on the scale of the Albatross IV series are particularly valuable in determining the relation between fish distribution and environmental factors. The reason is that they cover a large area within a short time and neither the environment nor the fish distribution will change very much. With proper spacing, surveys can measure efficiently seasonal migrations which, for most species, are correlated with seasonal temperature changes.

Red and silver hake, for example, are in shoal waters during summer and autumn when bottom temperatures are high (maximum in autumn). They move off the shoals into deeper water during the winter, presumably in response to winter cooling; they are concentrated along the shelf edge in deeper, warmer water during spring, when shoal water temperatures are lowest (Figs. 7, 8, 9, in appendix).

Improved knowledge of distribution and seasonal movements makes it easier for

fishermen to find fish concentrations; it also provides a better basis for establishing effective management policies when it becomes necessary to limit or redistribute the harvest. A case in point is the current U.S.-USSR bilateral agreement in the Middle Atlantic Bight. This was designed to help protect the U.S. industrial fishery, which depends chiefly on inshore migrants of the hake stocks in late spring and summer (Lundy, 1969). Knowledge of the spring concentrations of hake was taken into account when "closed fishing areas" in early spring were selected. The areas chosen were closed to reduce the mortality of hake at a time when they were particularly vulnerable to the large USSR trawlers--but not available to the small U.S. boats of the industrial fleet.

Unexploited Stocks

Edwards (1968) has reported some first approximations of total biomass estimates for each major species, based on Albatross IV surveys, for the areas east and north of Hudson Canyon. Although these estimates must be confirmed by further study of trawl efficiency, they have served to focus attention on certain abundant species that so far have not been exploited.

For example, the largest single unexploited resource is the spiny dogfish, which has long been a nuisance to most U.S. fishermen. Since the dogfish is caught and sold for food in the eastern north Atlantic, the population off our coast very likely will be harvested in the near future.

Spiny dogfish migrate seasonally, but the nature of these movements is not yet well known. Jensen (1969) reported that all available evidence, including our groundfish survey records, indicated a general movement to the south and into deeper waters during the winter, and a reverse movement in the summer. Before 1967, our surveys generally stopped at Hudson Canyon, but the usual southern limit of the dogfish migration in our area is thought to be in the vicinity of Cape Hatteras. The recent extension of Albatross IV surveys south to Cape Hatteras has greatly improved our capacity to monitor the dogfish movements; so far, the data confirm Jensen's conclusions for the survey area. In fall 1967, spiny dogfish were most abundant between Cape May, N. J., and Nantucket in depths less than 100 meters (55 fathoms). In that region, the largest catches were made near the 30-meter (15-fathom) isobath, which represents the approximate inshore boundary of Albatross IV surveys (Fig. 10 in appendix). In the following spring, dogfish had moved at least as far south as Cape Hatteras. They also moved offshore in all areas, east and north as well as south of Cape Cod.

Other Studies

Details of the studies mentioned above and many others will be forthcoming in the next few years in papers by BCF biologists. The groundfish surveys also are providing valuable data for many non-BCF scientists. In particular, there are current investigations by state biologists, graduate students, and others on various phases of the ecology of several species of hake, squid, flounders, dogfish, crabs, butterfish, skates, and sea robins.

LITERATURE CITED

EDWARDS, ROBERT L.
1968. Fishery resources of the North Atlantic area. In "The future of the fishing industry in the United States." University of Washington Publications in Fisheries, New Series, Vol. 4, pp. 52-60.

JENSEN, ALBERT C.
1966. Life history of the spiny dogfish. U.S. Fish Wildlife Service, Fisheries Bulletin 65(3):527-554.

LUNDY, BARBARA
1969. U.S. and USSR agree anew on Soviet fishing off U.S. Mid-Atlantic Coast. Com. Fish. Rev. 31(1): 38-41.

MUSSELS: A POTENTIAL SOURCE OF HIGH-QUALITY PROTEIN

T. Joyner and John Spinelli

The success of mussel culture in several parts of the world suggests that further mechanization of cultivation practices--and their extension to appropriate growing areas not now utilized--could make a substantial contribution to increasing the supply of inexpensive, high-quality protein.

Mussels can be readily processed into dried concentrates, rich in protein, with desirable flavor, odor, and nutritional characteristics.

The exponentially growing deficit in the world supply of protein has been widely publicized. Among the proposals for reducing this deficit, the one for converting unutilized marine organisms into a dry, protein-rich, powdered concentrate has attracted much attention. The Bureau of Commercial Fisheries has undertaken extensive technological research into the development of a system for the conversion of fish into FPC (fish protein concentrate) of good quality with a promising market potential.

A viable protein-concentrate industry will require the use of a number of different species as sources of raw material. FPC of high quality has been produced from hake, as well as from oily species such as menhaden, herring, and anchovy. The need for high-quality marine protein for both human and animal use dictates a continuing search for suitable raw materials.

In any assessment of other marine sources of protein, mussels appear very promising. Their wide distribution, fecundity, rate of growth and growth density already have been adapted to highly successful culture systems in many parts of the world. The bulk of the world's commercial mussel harvest is sold fresh, in the shell. Development of markets for significant additional production will require close attention to development of suitable preservation and storage techniques--as well as to the stimulation of new markets for preserved and processed mussel products. If a dried concentrate, rich in protein, could be produced from mussels at low cost, it might generate market interest as a nutritional ingredient.

To explore the feasibility of using mussels as a source of dry, protein concentrate, we prepared samples from Puget Sound bay mussels (*Mytilus edulis*).

Preparation of Protein Concentrate From Mussels

Meats were removed from the shell, ground in a food chopper, and steamed for 5 minutes at a pressure of 5 lbs. After being steamed, the meats were extracted twice with hot isopropanol (80° C.) at a ratio of 2 parts solvent to 1 part meat. The extracted meats were then dried in a vacuum at 80° C. for 6 hours. The dried product was milled and screened to separate the protein from the byssal threads (holdfasts) that had remained with the meats.

A 13.5-percent yield (based on the weight of wet meats; 6.75% based on total weight of the mussels) of light-tan-colored concentrate was obtained by this process. Various opinions were expressed by a panel of tasters. Clam-like flavor, lobster-like flavor, hydrolyzed protein flavor and odor, and seaweed color were some of the descriptive terms used by the panelists. Subsequent work has shown that these qualities can be controlled by varying the extraction process. For example, washing the protein with acid in the presence of sodium hexametaphosphate prior

Mr. Joyner is Oceanographer, BCF Biological Laboratory
Mr. Spinelli is Research Chemist, BCF Technological Laboratory } Seattle, Wash.

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to extraction with isopropanol produced a product with only slight odor and flavor. Other work has shown that the protein can be extracted more easily by grinding the mussels whole. The resulting slurry is steamed, dried, and then crude milled. The protein can then be separated readily from the shell by air classification.

Nutritional Evaluation and Chemical Analysis

To evaluate the nutritional and chemical characteristics of mussel protein concentrate (MPC), samples produced by isopropanol extraction of steamed mussel meats were analyzed for proximate composition, minerals, and protein efficiency ratio (PER). Table 1 shows the results of these analyses.

Table 1 - Nutritional Evaluation and Chemical Composition of Mussel Protein Concentrate

Test or Component	Test Value or Concentration
PER	3.6[1/]
Protein.	70.0 percent
Ash	12.0 percent
Lipid.	0.2 percent
Carbohydrate (glycogen)	15.0 percent
Fluoride	<5 p.p.m.

1/Casein equal to 3.0.

MPC is readily dispersible in water--a characteristic probably related to its high content of glycogen.

Requirements for Production of MPC

From the standpoint of a potential processor of protein concentrate, the primary considerations--other than costs--underlying the desirability of a raw material are:

1. reliability of supply

2. ease of processing

3. quality (as reflected in the final product).

The first of these is strongly suggested for mussels by their successful commercial culture in Spain, Holland, France, Denmark, Italy, and Germany; and by recent successful experiments with off-bottom culture in Scotland, the Philippines, Venezuela, and Chile (Table 2). In a preliminary way, the last two characteristics have been demonstrated for the MPC sample prepared by BCF's Seattle Technological Laboratory.

Table 2 - Annual Mussel Production

	Development of Growing and Harvesting Systems[1/]	Weight in 1,000's of Short Tons (Live)[2/]		
		e	f	g
Chile. . . .	b, c	17.4-32.7		
Denmark. .	a	12.4-21.1	51.5	21.1
France . . .	a	28.6-41.2		33.0
Germany (Fed. Rep.)	a	5.3-12.6		12.6
Italy	a	13.3-23.0		13.3
Netherlands	a	93.9-127.4		101.6
Philippines.	a, c		2.2	
Spain. . . .	a	40.4-72.9	165	154
U.K. . . .	a, c	3.2-5.3		4.1
U.S. . . .	d	1.0-2.8		

1/ a Harvest predominantly cultured mussels
b mussel harvest principally from natural beds
c mussel culture conducted experimentally
d mussel culture absent.

2/ e FAO yearbook of Fishery Statistics (1967). 1961-67 statistics
f Ryther and Bardach (1968)
g Andreu, B. (1968)

When the practices of mussel culture in other parts of the world are considered as possible models for systems to produce the bulk needed for economic production of protein concentrate, the example of Spain is most encouraging. In two decades, from an historically insignificant status, the development of suspended culture has transformed the Spanish mussel fishery into the world's largest. In the deep Galician bays, rafts produce on the average 55 short tons of mussels per year (Andreu, 1968). The average size of a raft is reported by Ryther and Bardach (1968) to be 20 x 20 meters (4,300 square feet approximately 0.1 acre).

The total production in 1968 of six Galician rias (Fig. 1) was estimated at 154,000 short tons (Andreu, 1968). These drowned valleys occur within a 100-mile stretch of coastline facing the Atlantic. One of them, the Riá de Arosa, is a bay 20 miles in length and 89 square miles in area. There are 1,800 rafts covering but a small fraction of the total area. Estimated production for 1968 was 90,000 tons of mussels. Based on 6.5% yield of protein concentrate from whole mussel, this would be more than sufficient for a plant with an annual output of 5,000 tons of protein concentrate--enough to provide 12 grams per person, daily, for 1 million people.

Potential for Mussel Growing in U.S.

Whether culture systems in United States waters can be developed to approach the level of mussel production in Spain's Galician bays is not yet known. Fishery agencies in Scotland, Chile, and Venezuela have undertaken to adapt Spanish techniques to their waters.

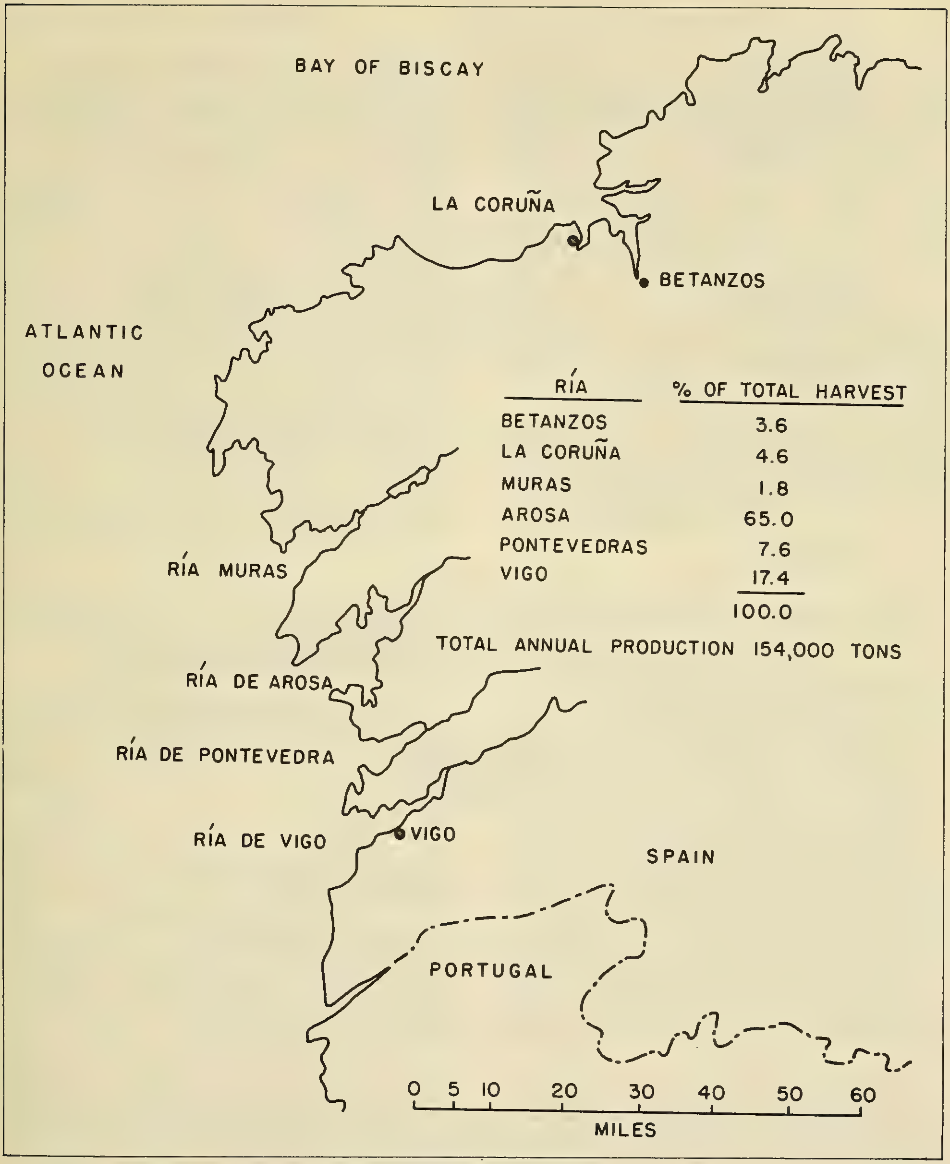

Fig. 1 - Mussel growing areas in Spain.

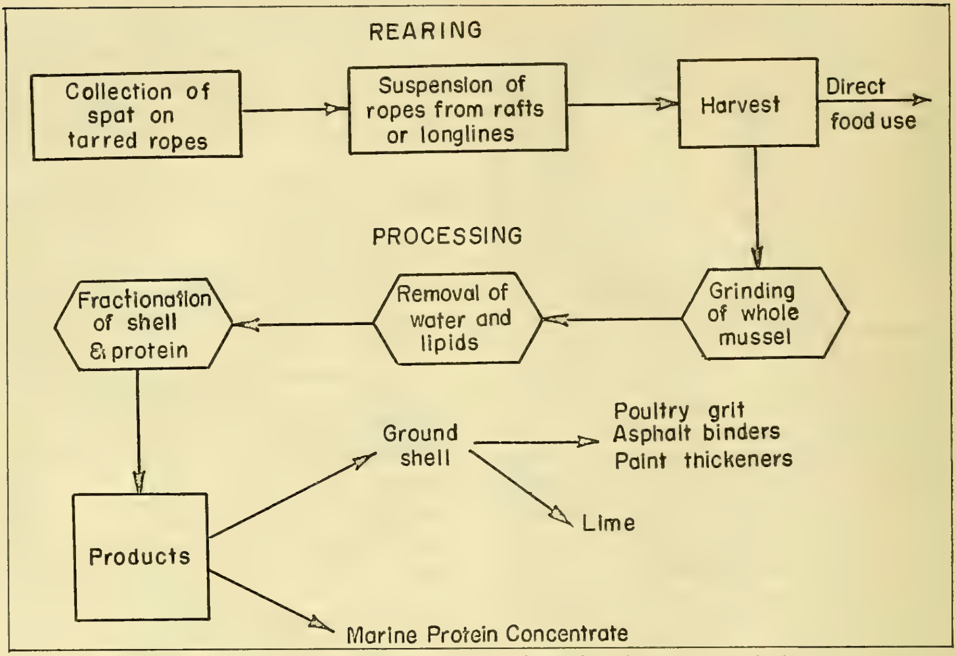

Fig. 2 - Mussel culture and processing into direct food use and protein concentrate production.

The Scottish experiments have been most encouraging. Mason (1969) reports that scientists of the Marine Laboratory, Aberdeen, have successfully grown mussels on rafts in Linne Mhuirich, an arm of Loch Sween, on the West Coast. Although the rate of growth is a little slower than in Spain, due to colder winter temperatures, it is far greater than any recorded for naturally growing mussels in Great Britain; it compares favorably with those recorded anywhere in Europe outside of Spain. The rope-grown mussels in Linne Mhuirich reached marketable size from seed in 14 months. As a consequence, a pilot commercial operation has been started in Linne Mhuirich, and several other loch sites on the West Coast have been proposed.

Table 3 compares the annual ranges of water temperature in areas in Spain, Scotland, France, and the Philippines, where off-bottom mussel culture is practiced, with those along the Pacific Coast of North America that might be considered for development.

Table 3 - Annual Ranges of Surface-Water Temperatures in Areas of Existing and Potential Mussel Culture

Area	Temp. °C.
Bay Mussel (*Mytilus edulis*)	
Brittany (France)1/	5-20
Linne Mhuirich, Scotland1/	2.5-20
Bay of Vigo (Spain)1/	9-21
Puget Sound (U.S.)2/	5-20
San Francisco Bay (U.S.)2/	7-20
San Diego Bay (U.S.)2/	14-20
Green Mussel (*Mytilus smaragdinus*)	
Manila Bay (Philippines)1/	25-30
Gulf of Calif. (Mexico)2/	21-30
Gulf of Nicoya, Gulf of Dulce (Costa Rica)2/ . . .	28-29

1/Existing commercial production of cultivated mussels.
2/Potential area for mussel culture.

The annual temperature ranges of U.S. Pacific Coast bays are similar to those of Western European bays where mussels are successfully cultivated; those of the Gulf of California and the Costa Rican gulfs are quite similar to that of Manila Bay, where the green mussel is being cultivated.

Paralytic Shellfish Poisoning

A potential source of trouble for mussel culture lies in the occasional appearance of a paralytic poison in mussels and other shellfish. Outbreaks occur in the coastal waters of western North America, particularly in the more northerly latitudes. They are caused by sporadic blooms of certain dinoflagellates ingested by shellfish. Fortunately, in areas in which mussels might be intensively cultivated, the presence of paralytic poisoning can be readily detected by regular monitoring. Harvesting would be curtailed during an outbreak until the monitoring program indicated that the level of poison in the mussel flesh had diminished to an established level of safety. The rate at which mussels release the poison after the source has disappeared varies with factors such as age, size, and condition of the mussels--and temperature, clarity, and rate of flow of the water. It is easy to see that monitoring would be simplified by the uniformity of age, size, and condition of cultured mussels. This would reduce the ranges of poison levels and time necessary to get rid of the poison.

Conclusions

The technology for mass production at low cost of protein concentrate suitable for human use is now being developed. Technologically and economically sound methods are available even now, and current research should yield further advances. A limitation to accurate economic assessment arises from lack of certainty about the supply of raw material and its probable cost to prospective processors. A thorough assessment of all promising sources of raw material is obviously needed.

Mussels should be given high priority in any such investigation. This is strongly suggested by the high quality of the test sample of MPC produced in Seattle; the apparent environmental similarities of potential growing areas in North America with areas of high production of cultivated mussels in Europe and the Far East; and the relative ease with which harvesting of cultured mussels could be controlled to avoid danger from paralytic shellfish poisoning.

LITERATURE CITED

ANDREU, B.
1968. The Importance and Possibilities of Mussel Culture. Working paper S. Seminar on Possibilities and Problems of Fisheries Development in Southeast Asia. German Foundation for Developing Countries. Berlin (Tegel). Sept.

FAO yearbook of Fishery Statistics. 1967.

MASON, JAMES
1969. Mussel raft trails succeed in Scotland. World Fishing, April.

RYTHER, J. H. and J. E. BARDACH.
1968. The Status and Potential of Aquaculture. Part II. Invertebrate and Algae Culture. Am. Inst. Biol. Sci., Washington, D. C.

WHAT MAKES A VERY SLIGHT SWELL (WAVE) BECOME MUCH HIGHER WHEN IT BREAKS ON THE SHORE AS SURF?

Until a wave approaches the shore, its height is usually about one-twentieth its length (distance from crest to crest); thus, if the crests are 20 feet apart, the wave height would be 1 foot.

When the water depth equals half the wave length, bottom friction begins to slow down the speed of advance. With a wave length of 20 feet, this would take place when the water depth is 10 feet.

As the wave slows, the back of the wave crowds the front, piling the water higher. The lower part of a wave, being nearest the bottom, is slowed more than the top; as a result, the top begins to curl over. When the wave height reaches three-fourths the water depth, the wave topples over as a breaker. ("Questions About The Ocean," U.S. Naval Oceanographic Office.)

FISHERY OCEANOGRAPHY--II

Salinity Front at Entrance to Washington's Strait of Juan de Fuca

Felix Favorite

Little is known about the reaction of fish to conditions in their natural environment because measuring, monitoring, and understanding these conditions require a cadre of oceanographers with training in several disciplines and much time. Fishery oceanographers have not made the impact upon fisheries that could, or indeed must, be made if we are to understand completely the causes of long- and short-term fluctuations in the components of the resources.

Where to Fish?

Once a net or other device has been retrieved, or a fishing operation completed, several things are apparent: the catch is either large or small, the fish are either the same or different species, and either marketable or unmarketable. Except for sorting and storing the catch, the men are ready to fish again. The question is: Where? If fish traces appear on the echo sounder, the problem is solved; if not, a search is begun on a grid, or at random. Standard oceanographic techniques of the past would help little at this point to decide in which direction to maneuver. It requires hours to take and process data from a Nansen bottle cast and ascertain the distribution of water properties with depth. Observations at 2 or more stations would be needed to determine a current pattern or other environmental features. And, of course, the analytical procedures are fairly technical. One cannot blame the fisherman for preferring to continue with his random or intuitive search.

Modern Technology Helps

However, modern technology is rapidly reducing the tedious and time-consuming analytical work by providing equipment that permits direct readings of water properties significant to fishing. One such piece is a surface temperature and salinity recording device. With this device, a probe is inserted in the engine intake or attached to the hull's outer part, and a continuous record of temperature and salinity at the surface is recorded in the wheelhouse or other desired location. Continuously recording thermographs have been in use aboard some vessels for years, but the salinograph has been available only within the past decade. Instruments with high accuracy are expensive and not in common use, even aboard oceanographic or fishery research vessels, but less expensive models are sufficient for some purposes. The necessity of measuring salinity--and also recording it continuously to detect significant environmental changes--was clearly shown during recent cruises of two BCF research vessels: 'Miller Freeman' off California and 'George B. Kelez' off Washington.

Pacific Salmon

One group of valuable fishes off the U.S. west coast is the Pacific salmon (genus Oncorhynchus). By intricate and incompletely explained mechanisms, they are able to return to the fresh-water stream or lake where they were spawned after 1 to 3 or more years in the ocean. It long has been suggested, and it is a reasonable hypothesis, that the discharges of rivers along the coast serve as guideposts. Until our high-seas studies began, it was generally believed that the salmon never migrated far beyond the continental shelf, or from the influence of their natal streams.

As far south as San Francisco, local runoffs from river systems to which salmon migrate can be detected as seaward plumes of low salinity. These plumes carry with them specific chemical relations, odors, or other identifying characteristics detectable by salmon. Such a plume was seen off San Francisco Bay during the Freeman cruise; its configuration was grossly delineated from data obtained at closely spaced oceanographic stations, rather than from a continuously

Dr. Favorite is an Oceanographer with BCF's Biological Laboratory, 2725 Montlake Blvd. East. Seattle, Wash. 98102

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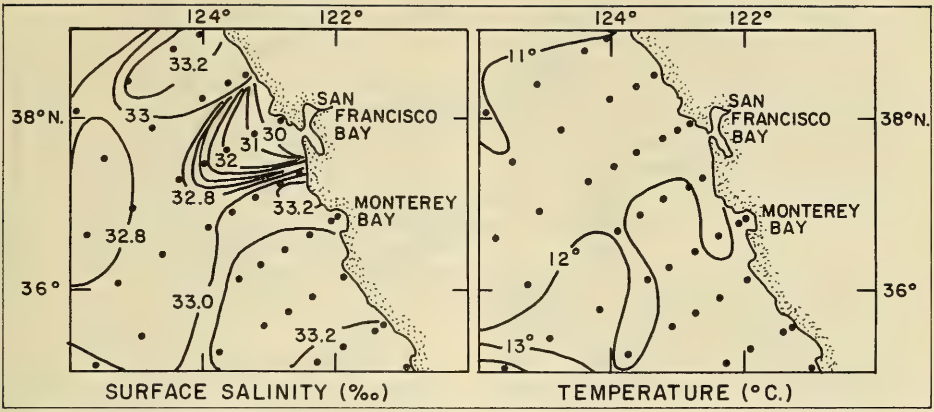


Fig. 1 - Distribution of surface temperature and salinity off San Francisco Bay showing plume of low salinity extending seaward, undetectable in the temperature distribution, February 1969. Station locations are shown by dots.

recording device (fig. 1). The seaward gradient of salinity is fairly well defined because the stations are only about 20 km. (12.4 m.) apart. But stations along the coast are 60 km. apart and, obviously, it is impossible to ascertain whether or not a sharp front exists at the northern and southern edges of the plume. It is also obvious that surface temperatures provide no indication of the plume's presence.

The Columbia's Plume

The area offshore of the Columbia River is a much better example. Not only can the plume be seen from the air--extending into the ocean during late spring, straight as a superhighway--but the demarkation line between the surface lens of silt-laden runoff and the relatively clear blue-green coastal water is obvious even aboard ship, when the north and south edges of the plume are crossed many miles at sea. In fact, the plume's seaward extent, as determined by dilute surface water, can be traced at times over 500 km. offshore.

However, just north of the Columbia River, the runoffs from rivers in Washington and southern British Columbia flow seaward through the Strait of Juan de Fuca. Tidal and turbulent mixing from sills in the inland waters reduces the possibility of this fresh water forming a dilute surface lens, and thereby maintaining its identify in the ocean.

Even up to the present, observations in the Strait at 10 to 30 km. intervals, made largely by local research vessels, have indicated only a slight salinity gradient from the Strait's inner reaches into the ocean, and no indications of a sharp salinity front at the entrance. Nevertheless, during an April 1969 Kelez cruise (she is equipped with continuously recording temperature and salinity device), we discovered 2 salinity fronts: a marked one inshore, with an increase of 2 to 4 ‰ (parts per thousand) in 4 km., and a lesser one offshore with an increase of about 1 ‰ over the same distance (fig. 2). These fronts also were noted in about the same position on April 4, a day later, as the vessel returned to Seattle along the same track.

The device was operated again as the vessel departed Seattle on April 16. The inshore front was clearly present about 75 km. northwest of one observed April 3-4, but the offshore front was not so clearly defined. Both times, the temperature changes across the fronts were slight, almost negligible. However, the salinity changes were large, considering that there is little change in surface salinity from the offshore front across the Pacific Ocean at this latitude. Thus, it is at this location that an organism might first detect any indication of coastal water. We know also from drift-bottle experiments that the flow along the coast is northward at this time of year. A northward flow of dilute water discharged through the Strait would explain why the southern inshore front lies so close to Cape Flattery.

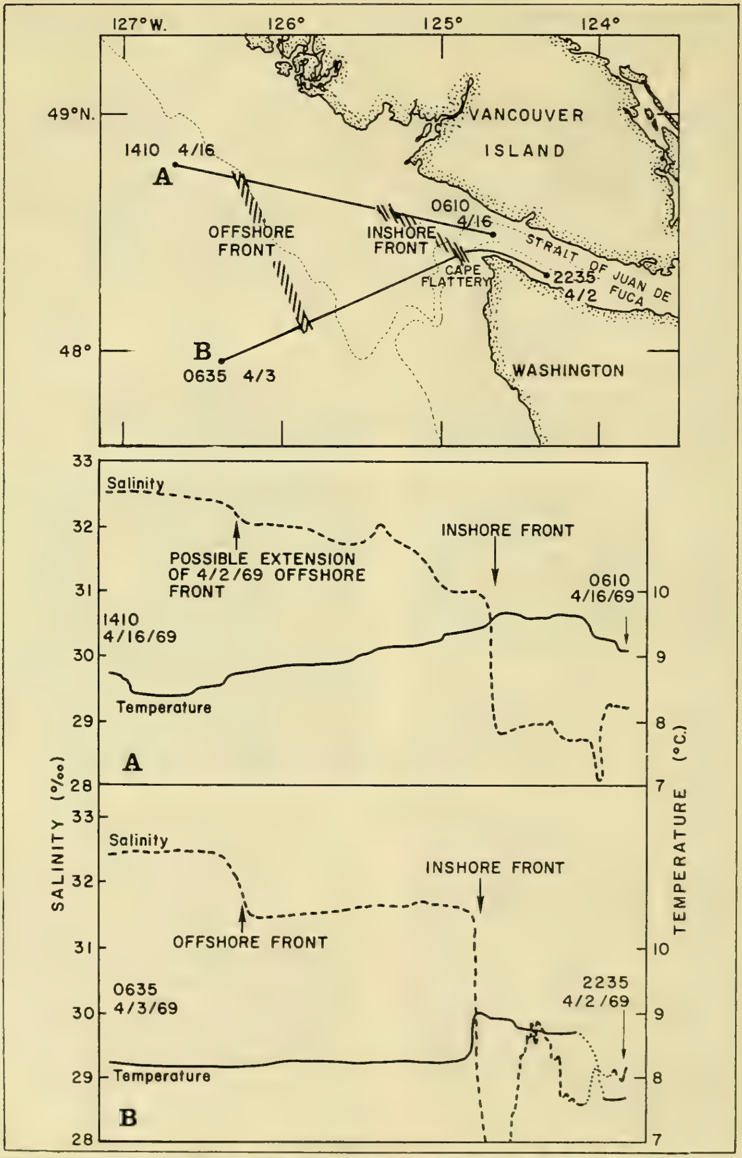


Fig. 2 - Continuous surface temperature and salinity traces seaward of the Strait of Juan de Fuca in April 1969 showing inshore and offshore salinity fronts at which temperature changes are slight. Temperature is indicated by solid line and salinity by dashed line. Dotted lines show traces originally recorded on a different time scale. Salinity trace for April 2 went off scale at 28 ‰ at about 3 a.m. on April 3.

Is this knowledge of use to the commercial fisherman? The answer is unknown--no fishing was done; on both cruises the vessel was merely enroute to and from Seattle. The commercial troll salmon fleet has operated off Washington for years; at times in spring it is in a north-south line well off the coast, perhaps at one or both of these local fronts. But it is impossible to be certain because no concurrent salinity measurements have been made. Even when fishermen make surface temperature measurements they are not very helpful because temperature just doesn't seem to be a significant property in this situation.

Fraser Sockeye Salmon

We also know that sockeye salmon (O. nerka) returning to the Fraser River mill around well off the west coast of Vancouver Island before they enter inshore waters--sometimes in such concentrations that they are easily observed from a plane. Furthermore, downstream migrants from southeastern Alaskan streams are known to migrate offshore and then northward around the periphery of the Gulf of Alaska at a distance offshore along a path coinciding with the location of this salinity front. Unfortunately, the spacing of surface salinity observations in this area has been 30 to 100 km.--too great to delineate a significant front. Only a slight salinity gradient, a seaward characteristic of any coastline, is usually indicated by these widely spaced data.

I have implied that salinity may affect the distribution of salmon off the Strait of Juan de Fuca, but the entire story may involve much more. In the first article of this series (July 1969 CFR), I mentioned that several aspects of oceanography should be examined to determine meaningful relations between fish and their environment. The food of fish, for example, would be a logical thing to study. With this in mind, we discovered in spring 1963 that euphausiids, a shrimplike planktonic

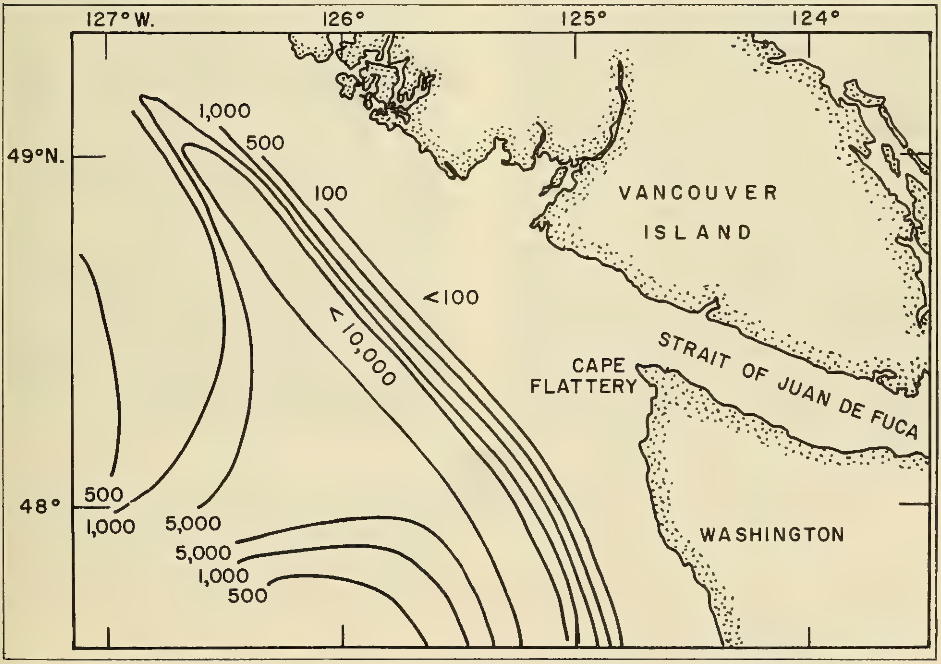


Fig. 3 - Distribution and abundance of euphausiids near the Strait of Juan de Fuca, spring 1963. Abundances determined by catches of euphausiids during 30-minute oblique tows from 30 m. to the surface when a 3-foot Isaacs-Kidd midwater trawl was used.

animal on which salmon feed, were concentrated near the 183-m. (100-ftm.) curve off the Strait (fig. 3). We do not know if euphausiids cannot tolerate the dilute inshore water, if they have enough mobility to avoid areas of low salinity, if they are quickly consumed by larger animals such as fish or whales, or if their distribution in spring 1963 was unusual. Is it possible that salmon feed heavily here before they enter inshore waters and migrate up their natal streams to spawn?

Unanswered Questions

Other questions must be answered: What happens to these fronts when the northward coastal flow ceases in spring and the southward flow, characteristic of summer conditions, begins? What happens to them during the period of maximum runoff later in spring when the snow in the rainshed melts? What is the cause of the offshore front? What effect do the fronts have on the distribution of albacore (Thunnus alalunga) and other fish off the coast in summer? We know little about oceanographic conditions and processes off this coast and hope to correct this deficiency during the Ocean Decade Program, expected to begin in 1970.

In summary, I have shown that the unique feature of the discharge of dilute water out of the Strait of Juan de Fuca in April 1969 was that it did not exist as a plume (as evidenced off San Francisco Bay and known to exist off mouth of Columbia River), but as a sharp salinity front along the entrance. Vessels of fishery and oceanographic research agencies have passed through the Strait for decades, but no one had measured or reported the abruptness of the fronts. I have been concerned about this feature. In the past, when I was not involved in salmon research nor had recording equipment, I looked in vain for a visual indication of a coastal front when transiting this area.

Therefore, when one asks, "What conditions in the ocean may affect the movements of seaward and shoreward migrating salmon?"--and uses a proper instrument to measure critical water properties--interesting results are obtained and further hypotheses can be tested. This I suggest is fishery oceanography. Proper investigation of this front would require 2 vessels: a research vessel moving along the front and making oceanographic observations at the surface and at depth while searching with sonic devices for fish; and a vessel ready to fish on short notice when interesting conditions are encountered. It is important to observe environmental conditions--and to fish when stocks are known to be in the area. To do one without the other ignores half the task. Furthermore, this phenomenon is not necessarily a physical or chemical oceanographic feature. The biological oceanographic implications also are interesting.

One should make this phenomenon known to salmon troll fishermen and encourage them to use oceanographic observations as a guide in selecting fishing locations. One can ask other research agencies, such as the Coast Guard and ESSA (Environmental Science Services Administration), to observe and report the location of the front as their vessels transit the area. Usually, specific requests that have a known use are acted upon expeditiously. This information could then be broadcast to the fishing fleet in time to aid its planning.

A small group can conduct only a limited amount of research. Our oceanographic studies in relation to salmon distribution have been conducted on the high seas, particularly in the central Subarctic Region. There, the distribution appears to be indicated more by temperature than by salinity. This aspect will be discussed in the next article.

FRESH FISH SHIPMENTS IN THE BCF INSULATED, LEAKPROOF CONTAINER

Robert L. Wagner, Allan F. Bezanson, & John A. Peters

The Bureau of Commercial Fisheries' leakproof, insulated, shipping container can be used to expand the markets for fresh fish to inland cities not now reached--provided reliable transportation can be found. This article describes tests made using the conventional nonrefrigerated trucking system to transport containers of fish to retail stores in three cities for 10 weeks. In general, the results were encouraging despite delays caused by trucking strikes in one city.

The March 1968 issue of COMMERCIAL FISHERIES REVIEW (CFR) contained a report describing the development of an insulated, leakproof, container at the Bureau of Commercial Fisheries Technological Laboratory in Gloucester, Massachusetts. It explained the need for a container suitable for extended shipment of chilled fishery products via air, rail, refrigerated or nonrefrigerated truck. It presented the details of the container, which we believe meets the need.

Now we give the results of an extended series of shipping tests in which we shipped fresh fish via conventional nonrefrigerated trucks.

Nonrefrigerated trucks provide service to almost every section of the country. The truckers will handle small lots (one or more packages) and, within 3 days, can reach cities within a 700-mile radius of Gloucester. These companies pick up at the shipper's plant, transfer to one or more truck lines as needed, and deliver directly to retailers or distributors. However, unknown factors in this service are: (1) time that might be needed to reach various cities, (2) type of handling container might receive and effect these factors might have on quality, and (3) the long-term, week-to-week, reliability of the service.

Therefore, we set up a series of test shipments that would provide us with information on (1) the time trucks needed to reach 3 selected cities, (2) condition of product and container on arrival, and (3) overall reliability of the service.

Procedure

Selection of Cities

One criterion used in selecting cities was distance. We wanted to have the shipments sent to 3 locations within a radius of about 700 miles from Gloucester. Another very important criterion was that there be a retail outlet in the city in which we knew, from previous contacts[1/] that people would be willing to help us record the necessary data each week for a total of 10 weekly shipments. Combining the 2 requirements resulted in selecting Burlington, Vermont, 175 miles from Gloucester; Syracuse, New York, 355 miles away; and Pittsburgh, Pennsylvania, 635 miles away.

Packing

Each Friday afternoon, fish that had been caught 2 to 4 days before were obtained from processors in Gloucester. Each shipment consisted of two or three 25-pound-size fillet tins. One was filled with haddock fillets; the other or others with whiting, ocean perch, or pollock, depending on availability. The tins were held over the weekend in a chill room at 33° F., then packed in the shipping containers on Monday morning. The containers and method of assembly were essentially those described in CFR. (Figure 1 shows a container being prepared for shipment.)

Mr. Wagner is Northeastern University Cooperative Student
Mr. Bezanson is formerly Mechanical Engineer
Mr. Peters is Supervisory Research Chemist

1/Selection would have been very difficult without help from BCF Division of Marketing.

U.S. DEPARTMENT OF THE INTERIOR
Fish and Wildlife Service
Sep. No. 849

Fig. 1 - Preparing BCF insulated, leakproof, container for shipment.

For the first 5 shipments, refrigeration was provided by ice frozen in polyethylene bottles, each containing about 2 pounds of ice. The bottles were placed under, beside, and on top of the fillet tins to provide 24 pounds of ice for the Burlington shipments and 30 pounds each for the Syracuse and Pittsburgh shipments. For the last 5 shipments, a slab of absorbent urea-formaldehyde foam was placed under the fillet tins, and 10 to 15 pounds of the bottled ice were replaced with an equal weight of loose flake ice. As the ice melted, the water was absorbed by the urea-formaldehyde foam, so no free water accumulated in the container.

Shipping the Fish

Each Monday, for 10 weeks, the filled containers were picked up at the laboratory by a local intercity truck and taken to Boston, where the containers were transferred to interstate truck lines. On arrival, the containers usually were transferred again, either to a smaller truck of the interstate trucker, or to a truck of a separate company specializing in city deliveries. Then the containers were delivered to the final destination.

Recording Information

On delivery of the containers, the recipient noted the date and time of arrival, condition of container, condition of product based on its odor and appearance, temperature of product, temperature of outside air, pounds of ice remaining, and whether any free liquid was present. The information was then mailed to the laboratory for summarizing. The findings are presented in table and discussed below.

Results of Shipping Tests

Burlington

On the whole, the shipments to Burlington were the most successful, particularly in punctuality; the slowest shipment was only $1\frac{1}{2}$ hours later than the fastest. Although the average of all product temperatures was 35° F., the products packed with bottled ice averaged 37° F., and those packed with some flake ice averaged 33° F.

Syracuse

Deliveries in Syracuse were considerably more erratic than in Burlington. Of the 10 shipments, 5 arrived in about 1 day, but 3 others arrived in 3 days. The quality of the

Summary of Data Recorded During Intercity Shipping Tests

Destination	Shipping[1] Time		Condition of Container	Condition of Product	Product[2] Temperature		Outside Air[3] Temperature		Ice Used Per 24 Hours		Amount of Free Liquid
	Ave.	Range			Ave.	Range	Ave.	Range	Ave.	Range	
	. . (Hours) . .				°F.	°F.	°F.	°F.	. . (Lbs.) . .		
Burlington, Vt.	25.5	25.0 to 26.5	Good to Very Good	Good to Very Good	35.0	32.0 to 39.0	52.0	30.0 to 67.0	5.2	3.0 to 6.8	Trace
Syracuse, N.Y.	45.5	23.0 to 77.0	Good	Good to Excellent	33.8	32.0 to 38.0	63.2	40.0 to 84.0	4.2	1.7 to 6.6	None
Pittsburgh, Pa.	70.25	50.0 to 75.0 [4]	Very Good	Fair to Good	36.9	35.0 to 40.0	42.3	32.0 to 60.0	6.9	6.0 to 7.3	Trace

1/Shipping time is elapsed time between loading on truck at Laboratory and unloading at final destination.
2/Products were all at 33° F. when packed.
3/The outside air temperature in Gloucester at time of packing averaged 59.2° F. and ranged from 43.0 to 75.0° F.
4/Three shipments were delayed up to 1 week by various causes. These times are not included.

product, however, was unimpaired; temperatures were satisfactorily low, and sufficient ice remained to safeguard product for an even longer period. Again, products packed with all bottled ice had slightly higher average temperatures--34.5° F.--than those packed with some flake ice, where the temperature of the products averaged 33.0° F. The average of all shipments was 33.8° F.

Pittsburgh

Shipments to Pittsburgh were least successful. Two were delayed by strikes until the fish were inedible; in a third, the container was lost in the city and not found until after fish had spoiled. With the successful shipments, however, deliveries were punctual; although the temperatures of the fish were a little higher than desirable, they were not excessive, and no significant loss in quality had occurred. Differences in temperature also were noted in the Pittsburgh shipments. The products packed with all bottled ice averaged 38° F. compared with 35° F. for products packed with some flake ice. The overall average temperature was 36.9° F.

General

In all shipments (except those delayed by strikes or lost), the insulation lining the container ensured sufficient ice to keep fish properly chilled for at least another 24 hours beyond time fillets were received. The containers showed no evidence of rough handling: all arrived in good or very good condition, and the fillets showed no significant loss in quality.

Fig. 3 - BCF Technologist prepares to examine shipment after delivery to retail store in Burlington, Vt.

Although delays were encountered in about 10 percent of the shipments, all occurred in one city where conditions were unusual at the time of our tests. In routine shipments, with improved communications between consignor and consignee, delays caused by strikes or other unusual circumstances might be avoided by selecting alternate routes or means of transportation.

Conclusions

The conventional nonrefrigerated trucking system can be used satisfactorily to ship chilled fish to cities within a 700-mile radius of the processor. The BCF insulated, leakproof, container is eminently suitable for this use. It protects against loss of quality by preventing excessive increases in temperature during transportation; it prevents damage to other goods in the truck by ensuring that no fish juice or ice water can escape the container.

DICTIONARY

"Multilingual Dictionary of Fish and Fish Products," compiled by J. J. Waterman, Fishing News (Books), 110 Fleet St., London, E.C. 4, England, 1968, 431 pp., $18.50.

Each of the 1,117 entries in this dictionary provides names, descriptions, and processing methods, if applicable, in French and English. The Latin name is given for each species. Common names also are given in German, Danish, Spanish, Greek, Italian, Icelandic, Japanese, Norwegian, Dutch, Portuguese, Swedish, Turkish, and Yugoslavian (Serbo-Croatian). There is a separate index for each language.

FISH CULTURE

"The Fresh Water Cultured Fish Industry of Japan," by E. Evan Brown, Research Report 41, 1968, 57 pp. Information is available from Dr. E. E. Brown, Department of Agricultural Economics, Livestock-Poultry Building, University of Georgia, Athens, Georgia 30601.

Although Japanese farmers have raised fish for hundreds of years, production for commercial sale only began about 150 years ago. The industry grew slowly until the 1930's, but expanded rapidly during World War II. After the war, though largely ignored by the government, the growth continued. In 1950, output was officially calculated at 6,000 tons. From 1950 to 1966, volume increased to 41,000 tons, or by 583%. This was only $\frac{1}{2}$ of 1% of Japan's total 1966 catch, but 2.6% of the value of total wholesale sales. Each pound of cultured freshwater fish was worth more than 5 times the average value of other fish.

Dr. Brown spent July and August of 1968 in Japan studying freshwater fish culture. He describes the 4 major methods of culture, the 4 major species, marketing and institutional factors, and predicts the Japanese market for freshwater cultured fish will expand.

FISH PROTEIN CONCENTRATE (FPC)

"Protein-Enriched Cereal Foods for World Needs," edited by Dr. Max Milner, 1968, 343 pp., illus., $6.50. Order from American Association of Cereal Chemists, 1821 University Ave., St. Paul, Minnesota 55104.

This book contains 32 papers by 38 authors. Many are devoted to recent experiences in commercial production of low-cost, protein-rich, foods. The increasing importance of sophisticated marketing techniques is emphasized. Attention also is given to new processing techniques and the use of unconventional protein concentrates in formulating cereal foods, including bread.

"Enrichment of Cereal Foods in Chile with Fish Protein Concentrate," by Julio Santa Maria is of particular interest. Sr. Santa Maria describes the effort made in Chile since 1950 to introduce fish protein concentrate (FPC) into the diet of low-income groups. He regards FPC as a biologically and socio-economically efficient protein-enrichment resource, stable, nontoxic, and entirely acceptable to those in need of additional high-quality protein--infants, children, and pregnant women.

He believes that adequate supplies of a satisfactory product are being delayed unnecessarily by insistence on esoteric 'quality standards,' which may be unnecessary in Chile. The 'best,' he believes, in this case, is the enemy of the 'good enough.' He concludes that "the critical state of child malnutrition, due largely to protein deficiency, calls for major early action. For Chile, it is clear that fish flour, used as a supplement to cereal foods, is a resource of first choice."

NORTHERN FISHERIES

"Review of Fisheries in OECD Member Countries, 1968," Organization for Economic Co-operation and Development, Paris, 1969, 163 pp., $2.80. For sale by OECD Publications Center, Suite 1305, 1750 Pennsylvania Ave., Washington, D. C. 20006.

The Review covers the main fisheries developments in 18 countries--including Canada, Denmark, Iceland, Japan, Norway, and the U.S. The 18 countries provide about half the world's fish supply and handle around three-quarters the global trade in fish and fish products.

OCEAN ENGINEERING

"Handbook of Ocean and Underwater Engineering," edited by John J. Myers, Carl H. Holm and R. F. McAllister, McGraw-Hill Book Co., New York, 1969, 1,100 pp., illus., $32.50.

Designed to cover all aspects of ocean and underwater engineering, this work is the result of a cooperative effort between North American Rockwell Corp. and the U.S. Navy. Fifty-one recognized authorities in various fields of ocean and underwater engineering have contributed to it.

The practical engineering aspects are stressed in 12 major subject sections: basic oceanography; basic hydrodynamics; underwater fields and instrumentation; tools, rigging and machinery; underwater cables; underwater power sources; materials and testing; fixed structures; vessels and floating platforms; diving; ocean operations; and wind and wave loads.

PREDATOR CONTROL

"Electrical Installation for Control of Northern Sqawfish," by Galen H. Maxfield, Gerald E. Monan and Holbrook L. Garrett, SSR-Fisheries No. 583, Department of the Interior, Fish & Wildlife Service, 1969, 14 pp., illus. Available from Division of Publications, BCF, 1801 N. Moore St., Arlington, Va. 22209.

The northern sqawfish, a predator on young salmon and trout in major river systems of the Pacific Northwest, also is a serious competitor of desirable food and game fishes in many of the lakes and tributary streams of those systems. In northern Idaho, sqawfish, peamouth, longnose dace, and suckers have become the dominant fishes in water that formerly produced trout. The principal cause of this increase in rough-fish populations has been changes in the stream environment--warmer water, reduced bank cover, siltation, and intermittent flow.

An electrode array was used to divert sqawfish into traps during their spawning migrations at Cascade Reservoir, Idaho. This paper describes and illustrates the array, the methods used, and the results.

DATA PROCESSING

"Processing of Digital Data Logger STD Tapes at the Scripps Institution of Oceanography and the Bureau of Commercial Fisheries, La Jolla, California," by James H. Jones, SSR-Fisheries No. 588, Department of the Interior, Fish & Wildlife Service, 1969, 25 pp. Available from Division of Publications, BCF, 1801 N. Moore St., Arlington, Va. 22209.

The development of continuous sampling STD (salinity-temperature-depth) sensors as a prime data collection tool for oceanographic cruises requires development of techniques capable of handling the data with modern digital computing equipment. This paper describes a technique developed for processing STD data collected as part of the EASTROPAC Survey Program. Assuming that the data has been digitized and recorded on IBM compatible tape in the field, Jones describes the computer programs needed for processing the basic data tapes. A listing of the program with subroutines is given in an appendix.

SHRIMP

"Gulf of Mexico Shrimp Atlas," by Kenneth W. Osborn, Bruce W. Maghan and Shelby B. Drummond, Circular 312, Department of the Interior, Fish & Wildlife Service, 1969, 20 pp., illus., $2.25. For sale by Superintendent of Documents, U.S. Government Printing Office, Washington, D. C. 20402.

Gulf of Mexico shrimp form the most valuable single U.S. fishery. From 1959 to 1963, an average of 107 million pounds (tail weight), worth $55 million to the fishermen, were landed annually. Three kinds of shrimp--brown, white, and pink--made up 98% of the landings.

The atlas illustrates the distribution and relative catches of the 3 species in the offshore commercial fishery. It also summarizes the commercial fleet's catch and effort, and the results of 15 years of exploratory fishing by BCF and the Fish and Wildlife Service.

--Barbara Lundy

INTERNATIONAL

International Herring-Tagging Experiment Begins

A large-scale herring-tagging joint experiment was scheduled to begin in July 1969 in the North Sea. Conducted by European countries, it is designed to estimate proportion of juvenile herring taken by commercial fisheries on Bløden ground and in northeastern North Sea and Skagerrak. In recent years, an increasing proportion of the catch there has been small herring.

The estimate is needed to assess effect of industrial fishing on recruitment to North Sea's adult herring stocks. The experiment also should provide useful information on movements of juvenile herring and pattern of migration.

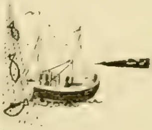
Number Tagged Important

Success depends, among other things, on possibility of tagging sufficient number. To achieve this, tagging will continue from mid-July 1969 till mid-March 1970. It is hoped 50,000 to 100,000 fish will be tagged.

All tagging will be carried out by a 3-man team from Norwegian purse-seiner 'Gerda Marie' chartered for this purpose. All fish will be tagged with internal metal tags inserted into belly. Recoveries will take place in fish-reduction plants handling commercial catches. Throughout tagging, research vessels will assist Gerda Marie to locate good concentrations and by experiments aimed at assessing tagging-produced mortalities.

Analysis in Spring 1971

The researchers hope that there will be enough tags returned by spring 1971 to permit analysis. The results will be made known. (ICES, June.)



Development of Fishing Systems for Distant-Water Fisheries Is Discussed

In April 1969, FAO's Department of Fisheries described the rapid improvement in the ways fish are found, caught, and handled as an "explosive growth in new technologies." At the 10-day International Marine and Shipping Conference in London in June, Dr. D. Bogucki, a Polish fishing-vessel design engineer, and Gordon Eddie, technical director of the British White Fish Authority (WFA), discussed the implications of this growth for distant-water fisheries. They said the increasing sophistication of the distant-water fishing vessel inevitably will make demands on engineer's skill and ingenuity.

Engineer's Role

Eddie strongly advocates engineer's role in research into vessel design and methods of fish catching and handling. Dr. Bogucki and his organization, the Ship Design and Research Centre (COKB) in Gdansk, are moving in same direction. ('Fishing News,' London, July 4.)

Evolution of a Vessel

Only 16 years ago (and in some distant-water fleets still operating) the typical ocean-going vessel was a very simple, single-decked trawler, usually less than 200 feet long overall. It bore unmistakable signs of sailing smack ancestry. It could be built by a small specialist yard for about US$240,000. It had evolved in ways "familiar throughout the history of shipbuilding." The skipper's main tools in finding and catching fish were experience, radiotelephone, and trawl itself.

While traditionalists may argue for the slow accumulation of experience, the economics of fishing demands faster methods.

Instead of $240,000 for a vessel of known performance and reliability, today's owner must risk a huge investment. He should know whether the vessel will do the job he expects.

Vessel of Future

Eddie and Bogucki mention the "far reaching concept" of a fleet whose nucleus would be

a depot ship, perhaps nuclear powered, able to stay on remote grounds for the 4-year period between surveys. Its special hull would enable it to serve as a port and repair base for catchers that would stay with it on the grounds. Preliminary studies by Polish naval architects show it is practicable and can be justified economically.

Marketing's Role

A correct choice of a fishing system cannot be made without an overall systems analysis from sea bed to consumer's plate. Marketing may help by influencing demand to ensure that the main capital equipment, the vessels, are fully utilized. Marketing "may have a noticeable influence on the choice of size, type, and layout of the deep-sea fishing vessel of the future."

Antarctic Whaling Quotas Set for 1969/70 Season

Representatives of the Antarctic pelagic whaling countries--Japan, Norway, USSR--met in London June 20 to July 1. They agreed to submit a draft of an "Arrangement for the Regulation of Antarctic Pelagic Whaling" for the 1969/70 season to their governments.

The Quotas

The draft provides these allocations of the global quota of 2,700 blue-whale units fixed by the International Whaling Commission for the 1969/70 season: Japan 1,493 units; Norway 231; the USSR 976 units.

If the governments approved, the Arrangement would be signed on July 10 in Moscow. (International Whaling Commission, July 1.)

European Communities Council Adopts Zero-Duty Fishery Quota

The European Communities (EC) Council has adopted a regulation for the opening and distribution of a zero-duty import quota of 46,000 tons for fresh, refrigerated, or frozen herring from third countries. The quota is valid from June 16, 1969, to February 14, 1970.

The Council explains that because some members import considerable quantities it would be inadvisable to levy a customs duty on them; also, the EC Communities have certain commitments within GATT. However, the herring imported within the quota must be in line with the Community reference price.

How Quota Divided

The 46,000-ton quota is divided into regular and reserve parts. The first part of 40,200 tons is: Germany 31,600 tons; Netherlands 5,600 tons; Belgium-Luxembourg 1,800 tons; France 1,000 tons; and Italy 200 tons. The 5,800-ton reserve may be distributed to members that exhaust their quota shares. (U.S. EC Mission, Brussels, July 7.)

Japanese-Brazilian Firm to Start Fishing Shrimp Off Brazil

The Japanese firm Nihon Reizo has transferred about US$333,000 to its Brazilian subsidiary COPESBRA to build and operate three 100-ton shrimp vessels. Nihon Reizo owns 40% of COPESBRA's total shares.

COPESBRA (Companhia de Pesca Norte do Brazil) is whaling with one killer boat based at Recife. It is trawling for bottomfish with 3 vessels. So far, whaling has shown a profit of US$83,000, but bottomfish has lost the same amount. Therefore, Nihon Reizo decided to change from bottomfish to shrimp.

Shrimping at Amazon's Mouth

The 3 shrimp vessels to be built will be chartered under a joint venture for one year. Then they will become part of the joint venture under Brazilian laws. Shrimp fishing will be based at Belem and conducted at the mouth of the Amazon River. ('Suisancho Nippo,' May 12.)

Japan Sends Fishery Team to Peru

Japan will send a 10-man fishery survey team to Peru in October in response to a request for Japanese cooperation in developing Peru's fishery resources. The survey will study the fish meal industry and develop proposals regarding future Japanese assistance.

The decision to send a mission to Peru was based on the fact that Peru claims a 200-mile territorial sea. Since Japan must cope with that problem, she needs to establish closer relations with Peru. ('Suisancho Nippo,' June 21.)

Spanish-Moroccan Fishing Convention Published

A reciprocal fishing rights convention between Morocco and Spain was signed in January 1969. It divides the territorial waters of both countries into three zones and specifies the types of boats and equipment that may be used in each.

Three Zones

In zone A, from low-tide line to three miles offshore, only lines may be used, except for fishing anchovies, where appropriate purse seines and boats will be allowed.

In zone B, from 3 to 6 miles, trawling nets and purse seines may be used, provided that local fishing laws are observed and gross catch is limited to 50,000 metric tons. The exercise of mutual fishing rights in zones A and B will expire 10 years from the effective date of the convention.

In zone C, from 6 to 12 miles offshore, "historic rights" with respect to fishing are in effect. All types of equipment are permitted. Local regulations will apply equally to nationals of both countries.

Joint Ventures

An annex to the convention provides for Moroccan-Spanish cooperation in joint fishing companies (boats furnished by Spanish shipyards), and processing and marketing of fish products. (U.S. Embassy, Rabat, July 4.)

Draft Treaty on Southeast Atlantic Fisheries

An international treaty to safeguard fishing grounds in the Southeast Atlantic Ocean off southern Africa will be discussed in Rome, Oct. 14-23. The conference is being convened by FAO, which has invited 18 governments most immediately concerned, FAO member and associate member nations, and interested international organizations.

After its scheduled adoption, the Convention for the Conservation of the Living Resources of the Southeast Atlantic will be open for signature by all UN members and specialized agencies. It will enter into force after formal ratification by a prescribed number of governments.

Creates Commission

The convention provides for creation of an international commission to study and recommend to member states the regulation of fisheries in the area. This lies off Africa's western coast, between the mouth of the Congo River and the continent's southern tip at 50° S. latitude. The commission will be assisted by scientific advisory committee.

Fishing in the area has more than doubled in the past decade, largely because long-distance fleets from other parts of the world have moved into it. Certain stocks, particularly hake and pilchard, have been exploited heavily.

50 Nations Discuss Fishery Investment Opportunities

More than 100 representatives of government, industry, financial institutions, and universities from 50 nations will meet at FAO headquarters in Rome, Sept. 18-24, to discuss ways of promoting fishery investments in developing countries.

The International Conference on Investment in Fisheries will encourage and facilitate investments by providing needed information on investment opportunities, and on sources and methods of financing.

Money & Information Needed

FAO said that difficulty in obtaining investment capital is hindering the efforts of many developing countries to promote fisheries as a source of protein food and of foreign exchange earnings. Information is lacking on sources and methods of obtaining such capital. In the developed countries, information is needed on opportunities for sound investment and fishery development. The conference will try to bridge the information gap and indicate where opportunities exist for investment and sources of money.

Speakers & Subjects

A special feature will be a panel discussion on prospects for fishery development in some developing countries. Participants from companies with overseas interests--and from international, regional, and bilateral assistance and financial agencies--will examine capital requirements. Methodology and international coordination of investment planning also will be covered. The aim will be to solve the problems of some segments of the industry that resulted from overinvestment.

Some 50 background papers have been prepared for consideration by the meeting. They include briefs on investment opportunities prepared by developing countries, lending policy statements by banks, discussions of project evaluation methods, analyses of bilateral support programs, specifications of criteria applied by private firms in making investment decisions, etc.

For information: Mr. R. Hamlisch, Secretary of the Conference, FAO Fisheries Department Rome, Italy.

Fish Farming Combats Pollution

Fish farming, a growing source of protein foods, is receiving increasing attention as a means of water pollution control. This is reported in FAO's 'Fish Culture Bulletin' (Vol. 1, no. 3). The Bulletin highlights fish-culture developments around the world.

Polish scientists are experimenting with ways to convert nontoxic industrial waste, rich in organic compounds, into fertilizer for enriching fish-culture ponds. At the Academy of Sciences' Krakow Laboratory of Water Biology, sugar industry wastes have been used successfully to fertilize carp ponds. Such wastes increased fish production 5 times in test ponds in Golysz.

Polish Research

Almost similar results were obtained at the Research Institute of Fisheries and Hydrobiology in Vodnany. There, effluents from starch factories and waste water from poultries were used. Both substances, particularly the latter, produced life-sustaining plankton in ponds. There were encouraging increases in fish production and no residual effects.

Other Research

Researchers in India's Delhi University are using light to stimulate the breeding cycle of fish. The magazine states: "By exposing catfish to longer day lengths in the nonbreeding season by means of artificial light, it was found that the gonads attained maturity three months ahead of the normal season."

A "spectacular increase" in trout production is reported in France and Italy, which threatens Denmark's position as Europe's major trout exporter. Yugoslavia and Poland have begun to export trout to Germany. The Soviet Union also is becoming a major producer. Meanwhile, experiments are underway to grow rainbow trout in saline water. This would help reduce costs.

In Hamburg, Germany, common carp are being bred within the narrow confines of aquariums simply by maintaining a constant flow of water.

Man-Made Lakes: Opportunities for Development

Man-made lakes for municipal and industrial purposes require farsighted planning to ensure maximum benefits. This is the theme of a new booklet, "Man-Made Lakes, Planning and Development," published by FAO and other international agencies. It is a guide to planners in developing countries especially.

The 71-page illustrated booklet notes that man-made lakes and reservoirs generally are planned to meet primary needs--hydroelectric power, irrigation, water for human and industrial consumption, flood control, or navigation. However, "their construction generates innumerable secondary problems, many of which have proved to be very serious." Most of these may not have been evaluated in advance.

Ecologic Effects

These problems acquire primary urgency in time. They flow from the grave changes in a region's environment and ecology during and after construction of the lake. Populations must be displaced and resettled. Farm and pasture lands and forests are "drowned" by the rising waters. Fisheries may be destroyed by dams that hinder fish movements. Wildlife may be driven out. The entire economy and social organization are affected, even disrupted.

Poorly planned lake construction also may trigger explosive outbreaks of disease. In the Soviet Union, deforestation because of inundation led to increase in tick-borne encephalitis. In Asia, increased rice growing brought about epidemics of mosquito-borne encephalitis. The displaced peoples may carry their diseases as they migrate. Spreading waters also will transmit disease.

Proper Planning Needed

Proper planning would ease or eliminate such problems, enhance the lake's value, and open up prospects for wider social and economic development. Science and education also could be enhanced, especially in developing countries, because trained technicians would be needed. Unequalled opportunities would be offered for commercial and sport fishery development and for local recreation and tourism. Conservation and esthetic beauty could be advanced, and forests and crops grown in ecological affinity with the lake. Transportation might be improved by a new water link. This would promote boatbuilding and inland port industries.

Anticipate Problems

The booklet states: "Anticipation is the first key to the solution of the secondary problems that may arise when reservoirs are built." The second key is the "timely engagement" of the necessary experts to study all aspects of the project. "Dam engineering, with all its complexities, is a much more straightforward operation than the solution of all the ancillary social, economic, and ecological problems that arise before, during, and after the dam is built and the reservoir fills with water."

The publication carries a foreword by C.H. Clay, FAO Coordinator of Lake Projects. It was prepared with the aid of K.F. Lagler, School of Natural Resources, University of Michigan, U.S.A. It describes 4 African lake projects--Lakes Kainju, Kariba, Nasser, and Volta--in which FAO and other agencies assisted with planning and coordination of the type of studies described in the booklet.

Japan & Indonesia Sign Fishery Agreement

On July 18, Japan and Indonesia signed a 3-year fishery technical cooperation agreement at Jakarta. Japan will assist Indonesia in research and education programs. Japan will provide gear and equipment costing about US$278,000 and send 4 specialists.

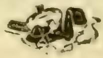
Indonesia will provide land, buildings, personnel, and pay administrative costs.

Japanese Aid Sought

Fishery assistance is one form of technical cooperation sought by Indonesia from Japan. Japan hopes the agreement will smooth negotiations with Indonesia on pending fishery problems. These include extension of agreement for safe fishing of Japanese vessels, which expired July 26.

Negotiations at Jakarta

The negotiations underway at Jakarta have produced temporary agreement to extend pact for one month pending further discussions. Since conclusion of the 1968 agreement, Japan has paid Indonesia about $30,000 in fishing fees for 96 vessels. ('Suisan Keizai Shimbun,' July 22, and 'Suisancho Nippo,' July 25.)



FOREIGN

CANADA

RAISES CEILING ON FISHERIES IMPROVEMENT LOANS ACT

Canadian fishermen now will be able to borrow up to C$25,000 under amendment to Fisheries Improvement Loans Act raising ceiling from original $10,000. The Act has been amended further to let fishermen borrow up to 90% of a project cost instead of the former 75%. There is one exception: a loan for a vehicle can be only $66\frac{2}{3}$% of purchase price.

A previous amendment freed interest rate on improvement loans. Now the maximum rate payable on the principal outstanding will be set twice annually. This will be 1% above cost of intermediate term money borrowed by the federal government.

What Act Provides

Some important points in the Act are: Loans may be made to buy or build a new boat; a used boat; repairs to boats; purchase of fishing equipment of all kinds and electronic fishing navigational aids; construction of buildings ashore and installations; and purchase of vehicles necessary for the fishing business.

More Lending Institutions

The Act also extended list of institutions that can make loans. Now included are charter banks, trust companies, loan companies, credit unions, and insurance companies. Loans must be secured. Details for a Fisheries Improvement Loan are worked out between fisherman and banker. The government is guarantor. ('Canadian Fisheries News,' July 15.)

* * *

MARITIME PROVINCES LANDINGS DROP IN MAY

In May 1969, 81.2 million pounds worth C$9.1 million exvessel were landed in the Maritime Provinces--Nova Scotia, New Brunswick, and Prince Edward Island. This included 37.5 million pounds of groundfish (C$1.9 million), 30.5 million pounds of pelagic and estuarial species (C$600,000), and 13.2 million pounds of shellfish (C$6.6 million).

Species Involved

Catch and value for each species group were lower than in May last year. The landings were substantially below the 1966-1968 average by about 7 million pounds, but the value was C$582,000 greater. Cod, herring, lobster, and scallop landings dropped slightly below the 1966-1968 average. Haddock, halibut, and flatfish decreased significantly (haddock dropped by 5 million pounds). Landings of ocean perch or redfish were almost 1 million pounds above the 3-year average.

Trawler Landings

Trawlers and draggers over 70 feet landed 28.4 million pounds during the month. This catch represented 75.7% of the groundfish landings and 88.5% of the scallop landings.

Total Landings

Total Maritime Provinces' landings for first 5 months of 1969 were 286 million pounds worth C$22.9 million. Total was 318 million pounds valued at C$24.1 million in 1968, and 200 million worth C$15.5 million in 1967.

Individual Provinces

The May catch, on an individual province basis, was substantially lower in all 3 provinces than in 1968. The catch in Nova Scotia was 41.2 million pounds (C$5.8 million), the New Brunswick catch was 34.2 million (C$1.4 million), and Prince Edward Island 5.8 million (C$1.9 million). This compares unfavorably with May 1968 when Nova Scotia landed 60.6 million pounds (C$7.3 million), New Brunswick landed 43.7 million (C$1.6 million), and Prince Edward Island, 8.5 million (C$2.9 million). (Economics Branch, Dept. of Fisheries and Forestry, Halifax, N.S.)

* * *

Canada (Contd.):

PAIR SEINE-NETTING TRIALS ARE SUCCESSFUL

An entirely new fishing technique, pair seine-netting, has been demonstrated successfully in a program to diversify small-boat operations on the Atlantic coast, Canada's Fisheries and Forestry Minister Jack Davis said recently. The method will benefit lobstermen in particular.

High Catch Per Effort

Two Prince Edward Island (P.E.I.) lobster boats, towing a single net between them, caught 7,000 pounds of sole and cod in 3 hours. They fished in 20 fathoms off Souris, P.E.I. The boats were adapted for pair seine-netting under the direction of a Scottish fishing skipper, who also supervised the first fishing trial. He estimated that the new technique would allow 10 tows in a normal working day. The 7,000-pound catch was made in 3 short tows.

Conversion Inexpensive

The machinery and gear needed to adapt the boats are relatively inexpensive, and the power requirement low, in comparison to regular draggers. Lobster fishermen should be able to work during the off-season months when normally their boats are tied up. Other types of low-powered inshore vessels also can be used, Davis said.

Gear and Methods

The trial boats made the bumper catches with a small Scottish seine net. The Scottish captain intends to replace this with a high vertical opening Vinge trawl as soon as hake start to appear on the Souris grounds; he expects equally good results. The net used is funnel-shaped, similar to a regular otter trawl in principle. The lobster boat skippers hauled the net by using a small winch on each boat and coordinated operations by radiotelephone.

The new technique is similar to the pareja (pair) trawling done by Spanish deep-sea trawlers in the Atlantic. Further extensive trials and demonstrations will follow and the results made public. (Dept. of Fisheries and Forestry of Canada, Ottawa, June 23.)

* * *

WINNIPEG TO GET NEW FRESHWATER RESEARCH INSTITUTE

An ultramodern C$7.5 million institute is to be built on the University of Manitoba campus at Winnipeg. The building, a federally financed structure, will house all of the Fisheries Minister's freshwater development staff.

Central Location

The University of Manitoba campus was chosen because 80% of Canada's freshwater lakes lie within a 1,500 mile radius of Winnipeg. The new Freshwater Fish Marketing Agency also is being located there because Winnipeg is the capital of Canada's freshwater fishing industry.

Research Projects

The Institute, with an initial staff of more than 340, will be concerned primarily with the future of freshwater fishing and the quality of the water in lakes, rivers, and streams from coast to coast. The accent will be on development and directed towards fish farming and improvement of existing fish stocks in northern waters. The staff also will be responsible for studies on eutrophication in river systems as far apart as the Okanagan in British Columbia and the St. John River in New Brunswick.

Renewable Resource Complex

The Institute buildings are the first of a series in what is expected to become "a renewable resource complex." It will include research laboratories, a working library, seminar facilities, fish-holding tanks, and pilot-plant facilities. It will be "second to none in North America," treble in size over the next decade, and attract some of the best biologists in the world.

Other Activities

The new 188,000-square-foot building also will provide space for the Association of Universities and Colleges of Canada, the Department of Energy, Mines and Resources Inland Waters Branch, and the Department of National Health and Welfare's Public Engineering Division. (Fisheries Research Board of Canada, June 27.)

EUROPE

USSR

MAY FISH ATLANTIC SAURY WITH ELECTRIC LIGHTS

In late autumn 1968, Soviet research vessels discovered large concentrations of Atlantic saury off Nova Scotia and on Georges Bank. Fishing with electric lights, exploratory vessels of the Atlantic Fisheries and Oceanography Research Institute (ATLANTNIRO) made good catches. The species reacts positively to electric light. It schools under blue light at about 20 meters; when blue flood lights are switched off and red lights are switched on, the school condenses and rises swiftly to the surface. This creates a "boiling" effect.

The Atlantic Saury

The Atlantic saury belongs to the same family as the Pacific saury (Scomberosocidae). It is distributed widely in the temperate and subtropical waters of the north and south Atlantic. It feeds on plankton and inhabits the surface layers of the open ocean. Its average length is 25-35 centimeters (maximum 45-46), and its average weight is 70-140 grams (maximum over 200). Migrations to the coastal waters of the U.S., Canada, Great Britain, and Spain have been observed.

Research Began in 1967

Soviet research on the stocks and biology of Atlantic saury began in 1967. Research and exploratory vessels of the Polar Fisheries and Oceanography Research Institute (PINRO) and ATLANTNIRO established that the life cycle of the Atlantic saury is associated closely with the Gulf Stream and the North Atlantic and Canaries Currents. Commercial concentrations were observed where the Gulf Stream converges with the cold Labrador current.

In Oct. 1967-Apr. 1968, ATLANTNIRO vessels discovered widespread saury concentrations in 2 areas (total of about 40,000 square miles) in the Gulf Stream off Newfoundland, and in the Newfoundland Basin.

When They Spawn

Apparently, saury spawn from Sept. to June. They reach their peak during winter-spring, when water temperatures range from 17 to 19° C. (62.6-66.2° F.). Spawning grounds in the North Atlantic are widespread, ranging from 46°30' to 28° N. lat.

May Be 2 Populations

Soviet scientists believe there are no less than 2 distinct saury populations in the North Atlantic--a west Atlantic (between 45 and 70° W. long.) and an east Atlantic one (between 13 and 38° W. long.).

In the South Atlantic, the convergence zones of the cold Falkland current with the warm Brazil Current, and the cold Benguela Current with the warm South-Equatorial Current, have the greatest potential for abundant, commercially exploitable concentrations of Atlantic saury. ('Rybnoe Khoziaistvo,' No. 5.)

Present Research

The Soviets are continuing exploratory research on Atlantic saury. At least one ATLANTNIRO research vessel is scouting the North Atlantic--from Georges Bank, along the Gulf Stream to the Newfoundland Basin--to determine the economic and operational conditions for a large-scale saury fishery using electric lights.

* * *

FAR EASTERN FLEET FACES REPAIR PROBLEMS

The Soviet Far-Eastern Fisheries Administration (DAL'RYBA) is facing serious repair problems for its fleet of 'Maiak'-class medium trawlers (SRTM). The reason is the shortage of floating docks capable of handling those vessels.

DAL'RYBA is well equipped to repair small SRT-300-class trawlers (260 gross tons). However, SRTMs (about 700 gross tons) have to be put in large floating docks designed to repair larger vessels such as stern factory trawlers (BMRTs) and factoryships. The smaller floating docks cannot hoist SRTMs. This has delayed considerably repair of BMRTs and large factoryships. The number of 'Maiak'-class medium trawlers of the Far Eastern fishing fleet has increased considerably over the last few years. Their

USSR (Contd.):

condition has deteriorated greatly because of maintenance deficiencies.

New Docking Technique

In 1967, 2 scientists at Kaliningrad Higher Navigational School devised a way to dock larger vessels in a floating dock designed for smaller vessels. The undisclosed technique is being introduced gradually only now because it had met with considerable skepticism.

After thorough and extensive testing, the method was approved by Soviet Fisheries Minister Ishkov and his DAL'RYBA Chief, Drozdov. Several SRTMs of that fleet have been repaired at Nevelsk shipyard on Sakhalin with the new technique. But Kamchatka and Primor'e shipyards continue to repair SRTMs in docks for large vessels. This is a bottleneck for entire Far-Eastern fishing fleet.

* * *

FAR EASTERN SEALING FLEET IS AGING

The Far Eastern Fisheries Administration is concerned about the Sakhalin sealing fleet. Many of the catcher boats are close to 16 years old and in bad need of repairs.

Several boats were withdrawn from service in 1967. In November 1968, the Fisheries Ministry ordered 3 sealing vessels to be repaired at Nakhodka shipyards. By mid-May 1969, only 20% of the required repairs had been completed, and none of the 3 vessels was operational. ('Vodnyi Transport,' May 17.)

* * *

RAISE FRESHWATER FISH IN SEA WATER

The All-Union Fisheries and Oceanography Research Institute is rearing carp and silver carp fry in Taganrog Bay of the Azov Sea. This is the first experiment in the Soviet Union in breeding fresh-water fish in the sea. The fry are held in pots at a depth of 3 meters. They feed on plankton and minced Azov sprat ("kilka"). The experiments are to last until late autumn 1969 and include zander, grass carp, and sunfish (centrarchid).

The purpose is to determine how freshwater fish acclimatize in marine conditions, how fast they grow, how much food they consume, etc. When tests have been completed, the Institute will issue recommendations for the culture of freshwater fish in marine waters.

Plans for Sunfish

The Soviets plan to release acclimatized sunfish in the Azov Sea hoping it will develop into a commercially exploitable species after a few years. ('Vodnyi Transport,' July 1.)

The source gives no indication of plans for the commercial introduction of the other species.

* * *

UNDERWATER LABORATORY IS PLANNED

Soviet news media report that Moscow University's Marine Geology Laboratory plans to build an unmanned underwater "observatory" to hover above the ocean bottom and record the environment continuously. The first "observatory" is to be assembled in the Black Sea not far from the city of Evpatoriia.

The Lab

Access to the laboratory will be both manual (divers) and automatic (acoustic command). Data will be recorded and transmitted frequently (4-6 times a day). In addition, the marine seabed will be photographed, and the photos synchronized with surface oceanographic observations.

The "observatory" will not be on the seabed but above it. Divers apparently will be able to use the laboratory by floating it to the surface and descending with it. The idea has wide support in Soviet academic circles. Several professors, including Chairman Zenkevich of the Oceanographic Committee of the USSR Academy of Sciences, were interviewed about the project.

Lag in Making Instruments

While praising the project, the news media also pointed out that the making of oceanographic instruments is in a messy state. Instruments designed for similar functions are

USSR (Contd.):

built in 3 or 4 laboratories separately, causing great loss of time and money. To avoid this, a Center for the Production of Oceanographic Instruments is advocated.

* * *

DEVISE NEW METHOD FOR SEALING FISH BARRELS

Specialists at the port of Klajpeda, Western Fisheries Administration, have suggested that fish barrels transshipped from medium trawlers to factoryships be topped with synthetic fabric held in place with a hoop. The conventional method is to seal barrels with a wooden top pressed into the barrel.

Method's Advantages

The new method increases barrel capacity and prevents squashing the top layers of fish, thus conserving quality. It also simplifies refilling barrels with ocean water. ('Rybnoe Khoziaistvo,' No. 4.)

* * *

ROLES OF EFFICIENCY EXPERTS AND INVENTORS ARE EMPHASIZED

A conference of fishing-industry efficiency experts and inventors has reviewed proposals and issued recommendations for speeding up technical progress in the fishing industry. The conference, held in Leningrad at "Inrybprom-68," was attended by 250 experts and inventors from the 5 Fishery Administrations.

Savings in 1967

"Technical creativity programs" (suggestions and inventions) involve some 25,000 fishery workers all over USSR. In 1967, adoption of the 26,000 technical suggestions and inventions saved 20.8 million rubles (US$22.8 million). The Western Fisheries Administration used 7,068 suggestions, saving 7 million rubles (US$7.7 million). The Far Eastern Fisheries Administration adopted 6,760, saving 6.6 million rubles (US$7.2 million).

Areas of Future Effort

The conference directed the efficiency experts and inventors to concentrate on: (1) devising new and more effective fishing methods with electric light, electric fields, and pumps; (2) designing new equipment to mechanize and automate fish-catching processes; (3) designing new navigational, exploratory, and gear-control devices; (4) improving fish processing and packing machinery to reduce waste; (5) increasing variety of edible fishery products; (6) improving ship-repair technology and reducing demurrage due to repairs. ('Rybnoe Khoziaistvo,' No. 3.)

* * *

CONDUCTS MIDWATER TRAWLING EXPLORATIONS OFF NW AFRICA

Exploratory midwater trawling was conducted by the Atlantic Research Institute for Fisheries and Oceanography (ATLANTNIRO) off northwest Africa, January-March 1968. Results were excellent. The research vessel 'Gizhiga' and the commercial freezer trawler 'Petr Liziukov' tested a newly designed 38.5-meter (126.3-foot) pelagic trawl. Various Soviet-made fish-locating devices for midwater trawling also were tested successfully. Explorations were conducted at varying depths in 3 areas: at 60 to 120 meters off Dakar; at 25 to 40 meters off Cap Blanc (Mauritania); and at 30 to 50 meters off Rio de Oro (Spanish Sahara). The Soviets have only bottom-trawled on a commercial scale in the area. The successful tests may induce them to develop a midwater trawl fishery.

Pelagic Trawling

Soviet interest in pelagic trawling mainly stems from the fact that the species they fish off northwest Africa (horse mackerel, mackerel, herring, Sparidae, and Scianenidae) school near the bottom only during certain periods of the year and at certain times of the day (mostly daylight). This has made the fishery strictly seasonal. However, these species are pelagic and frequently form huge midwater schools covering several hundreds of miles. 'Gizhiga' fished with bottom trawls in the daytime and with pelagic trawls at night. Best catches were at night. The operation proved the feasibility of a year-round commercial fishery using both pelagic and bottom trawls. ('Rybnoe Khoziaistvo,' Jan. 1969.)

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USSR (Contd.):

FILM INDUSTRY USES
DRIED KING CRAB SHELLS

A movie film factory in Kazan has requested the Far Eastern Fisheries Administration to supply it with dried king-crab shells. The factory will use them to produce color film. The Administration instructed 3 king crab factory vessels in the western Bering Sea of Kamchatka to fill the order. The shells will be shipped to Kazan from Vladivostok by Trans-Siberian Railroad.

United Kingdom

FROZEN FISH PRODUCTION
BREAKS RECORD

Britain's domestic production of frozen fish rose by more than 13% in 1968 to 94,111 long tons (from 82,660 tons in 1967). Home sales of frozen fish, supplemented by imports, increased by over 5,000 tons to 114,000 tons. Overseas sales increased by more than a third to 16,000 tons.

The White Fish Authority has estimated that nearly 218,000 tons of white fish--23.4% of the landings--were used for freezing in 1968. In 1967, 189,000 tons had been used. ('Fishing News,' June 27.)

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WHITE FISH AUTHORITY NEEDS
LOAN FUNDS

An increase in loans for vessels and removal of restrictions on growth of the inshore fleet, announced by the government last year, have turned out to be paper promises that 'meant little in practice,' according to a White Fish Authority (WFA) report.

Loan Rates

Although the maximum loan rate was increased, loan funds available to WFA was limited to US$900,000. As a result, the higher maximum meant so little in practice that, in November last year, it was announced that no further loans could be approved until the government allocation for the following year was known. A much higher provision of $2,040,000 for 1969/70 will make it possible for 50% loans to be approved in some cases.

Trawlers

Removal of the trawler scrapping condition had very little effect on application for building new vessels over 80 feet. Only one application was approved in 1968/69. But the WFA, aware that one-fifth the trawler fleet is more than 15 years old, hopes that improved profitability, assisted by the new subsidy scheme, will encourage new building during the coming year.

Inshore Fleet

The inshore fleet provided most of the new orders. During 1968/69, there were 170 applications for inshore vessels; 120 were approved--70 for England and Wales and 50 for Scotland--and 45 were being considered at the end of March 1969. In the previous year, 95 applications had been approved.

In the last 5 years, WFA has approved 384 new inshore vessels--228 in England and Wales and 156 in Scotland. But the larger Scottish boats got assistance of $4,437,600, compared with $3,084,000 for English and Welsh boats. Improvement grants rose from 1,449 in 1967/68 to 1,543 in 1968/69; 1,044 were for inshore vessels.

Landing & Price Patterns

The year fell into two distinct phases. The first half was marked by heavy landings from Scotland and inshore ports in England and Wales, and by massive surpluses at Humber ports. This pattern of landings reversed in second half. With less pressure from cheaper supplies from elsewhere, and helped by their minimum price structure mechanism, the English ports benefited from their increased landings. WFA sees this pattern of price movements as "a classic demonstration of the need for a statutory minimum price scheme for the UK, with a system of reserve prices to support it."

Rising Costs

The report is ample evidence of WFA's own struggle against rising costs. Total income rose from $1,382,278 to $1,405,015 due to an increase of $38,400 from technical charges. However, costs jumped from $1,485,761 to $1,591,778, leaving WFA with a $186,763 deficit. ('Fishing News,' June 27.)

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United Kingdom (Contd.):

WHITE FISH AUTHORITY OFFERS NEW SERVICES

An almost unique management-and-design service now is being offered by the White Fish Authority (WFA) on a commercial basis to fish companies and vessel owners. The staff of the Industrial Development Unit (IDU) in Hull will give firms the opportunity to apply the results of IDU work to their own problems.

The IDU

The IDU was established by WFA in 1963 to implement its research and development program. For the first time, highly qualified engineers were brought in to investigate and develop improved vessels, methods of fishing, and handling and distribution. WFA's technical director said: "This practical engineering approach has given us an unrivalled knowledge of fishing equipment and the way it is used."

In its 6 years, IDU has worked closely with owners, ship builders, and manufacturers. It has advanced considerably the techniques of measuring the performance of vessels and equipment under operational conditions; introduced the warp tension meter, Shetland gutter, hydraulic winches and power blocks, and improved echo-sounding systems; and developed new products.

IDU's success has aroused wide interest outside the U.K. Some leading fishing countries have been attempting to set up similar organizations. None has yet matched IDU's expert team of naval architects, mechanical, marine and electronic engineers, and operational research scientists.

Needs More Money

According to the 1968/69 WFA report, the main restriction on IDU's work is the shortage of money. "It is difficult at our present level of expenditure," says the report, "to undertake projects requiring annual allocations of more than US$48,000." To cover projects ranging from development of a telemetry system for trawlers to a winch brake, the research and development program spent US$1,027,200.

One effect is that IDU is hampered increasingly by its own accomplishments. As these reach the application stage, IDU has to spend more time disseminating the program results. IDU's head says this is part of the job, although it strains his resources.

WFA Report

The WFA report states: "It is not much use developing new techniques or equipment if the lessons do not get across to industry." It adds that the industry's appetite for information--which is provided in demonstrations, lectures, discussion groups--is "something we are not at present staffed to meet in full."

IDU Services

IDU's services will not include research and development for individual companies that are separate from all-industry programs. IDU will provide expert service, backed by digital computer and other data-processing machines, where "it is obvious that substantial staff effort will be required to provide an adequate answer to a particular enquiry or request."

It will try to build the most into the design of individual vessels by operational research methods, production control systems for processing plants, sales analysis, lorry routing, stock control, intership comparisons of costs and earnings, and economic and statistical services.

On the design side, IDU will provide designs and sketch plans for new vessels, designs to instal new equipment, advise on how instruments should be used, conduct trials and analysis of results, and prepare schemes for factory and factory-deck layouts.

IDU is not competing with naval architects or yards; both will do the detailed work on the suggestions. It will continue to advise and aid industry without charge. IDU says: "The new service is in no way intended to discourage the ad hoc consultation and discussion, which is a continuous and essential feature of the Authority's relationship with the industry."

The service will permit IDU to apply knowledge gained from broad industry projects to the more specific needs of fishing companies. ('Fishing News,' London, July 4.)

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United Kingdom (Contd.):

PLASTIC FISH BOX DEVELOPED

An all-plastic fish container has been developed by Pye of Cambridge. The company claims these advantages for it over the wood box: "Greater cleanliness, longer life, less weight, greater flexibility and ease of stacking, and greater ease of handling."

(Photos: Dunne)

The plastic box has been accepted by the Skagen Skipperforening, the Danish Fishing Skippers' Association. Deliveries have been made to Danish and Greenland fleets.

The plastic box measures 30" x $17\frac{1}{2}$" x 8" and is designed to take 50 kilos of fish.

Poland

MAKES GOOD CATCHES
IN NORTHWEST ATLANTIC

During first-quarter 1969, Polish fishermen made good catches in the Northwest Atlantic. Fishermen of the state-owned combine DALMOR caught over 50,000 metric tons of fish (species not known) during January 1-March 18, 1969.

DALMOR is the largest Polish deep-sea fishing company. Most Polish vessels sighted off the U.S. mid-Atlantic coast early in 1969 belonged to it.

To Fish Shrimp

Another distant-water fishing combine, ODRA, is planning to fish Georges Bank shrimp for canning. The 1969 quota was set at 200 metric tons. ('Polish Maritime News,' April.)

Earlier Catches

In 1968, the Poles caught 187,000 tons of fish from the entire ICNAF area (80,000 in subarea 5, Georges Bank). This was a sizable increase over the 120,000 tons (41,000 tons in subarea 5) caught in 1967.

Other Developments

In early 1969, the Poles began fishing southeast Atlantic hake off Angola. Daily catches averaged about 40 tons. In March 1969, 'Kwiska,' the first Polish trawler, was converted into a purse seiner.

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Poland (Contd.):

FIRST AUTOMATED STERN TRAWLER BUILT FOR FRENCH

On June 2, 1969, the flag was raised on the automated stern trawler 'Shetland,' built by Gdynia Shipyards for French owners, Nord Pêcheries of Boulogne sur Mer. It was designed by Gdynia Branch Office of Shipbuilding Industry's Design and Research Centre.

The Shetland is the 14th trawler built by Gdynia Shipyards for French owners, and the 25th trawler built by Polish shipyards for France. Shetland's prominent feature is extensive automation of the propelling system, engineroom arrangements, and fishing gear. The vessel will catch fish in the North Sea and North Atlantic grounds and ice them in 2 holds refrigerated to -4° C. (24.8° F.).

M/t Shetland. The prototype unit of the B411-type built at Gdynia Shipyard for French owners, Nord Pêcheries of Boulogne sur Mer.

Vessel's Particulars

The main particulars are: length o.a.--60 m. (196.8 ft.); length b.p.--52 m. (170.6 ft.); breadth 11.60 m. (37.7 ft.); draught 4.25 m. (13.8 ft.); capacity 333 tons; speed at trials at draught of 4.25 m. and engine power of 1,500 hp. on the propeller--14.2 knots; crew 80; no. of berths 26; capacity of reefer holds 550 cubic meters, of fuel tanks 289 cubic meters, of fresh-water tanks 49.80 cubic meters, and of salt-water tanks 52 cubic meters.

Electronic & Other Gear

Radio and electro-navigational aids are: radio transmitter and receiver, emergency transmitter, VHF radio station, radio-goniometer, gyro-compass and gyro-pilot, Decca radar, Decca navigator and course recorder, horizontal and vertical navigation and headline echo-sounders.

The main trawl winch is 3-drum, electrically driven, with a 12-ton hauling capacity. There also are 5 hydraulic winches: 2 can haul 6 tons and three 4 tons. This allows speedy and efficient heaving and shooting of nets and trawls. The fish are transferred through stern chute into storage compartment. Belt conveyors then move them to the processing compartment on bow. The fish are hand-gutted. After being rinsed in washing machines and separated, they are stored in loose ice in both refrigerated holds. ('Polish Maritime News,' June.)

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LED WORLD IN 1968 FISHING VESSEL CONSTRUCTION

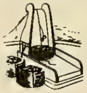
Poland, Japan, and East Germany led the world in fishery vessel construction in 1968. Poland built 30 vessels (totaling 126,500 gross tons), Japan 347 (99,760 tons), and East Germany 68 (89,700 tons). Spain was in 4th place with 58 (54,400 tons). All were listed in "Lloyd's Shipping Register." (The Register does not list vessels of less than 100 gross tons.) ('Pêche Maritime,' Mar.)

Exports

Many of the new vessels are exported. Polish-built vessels go to the USSR, U.K., France, Ireland, and other countries. East Germany exports to the USSR, Cuba, and Iceland. Japanese-built vessels go to the Republic of Korea and other countries.

Soviet Construction

Soviets do not furnish statistics on fishery vessel construction, but just one of several shipyards builds about 24 large stern factory trawlers, 3,200 gross tons each, a year. The Soviets probably would be first, if they chose to publish data. Additions to the Soviet fishing fleet, including purchases from West and East European countries, exceed those of any other nation.



THE SPANISH SEAWEED INDUSTRY

Norman W. Durrant

[The author, a BCF chemist, attended the Sixth International Seaweed Symposium, Santiago de Compostela, Spain, Sept. 9-13, 1968. He also investigated the Spanish seaweed industry.]

The seaweed industry, principally the manufacture of agar-agar, began in 1940 when the lack of Japanese supplies induced Spanish bacteriologists to try to obtain this product from Spanish seaweeds. Small-scale investigations were started and imitated Japanese techniques.

Spain has centered its seaweed activities primarily on the manufacture of agar-agar. This industry has undergone such a rapid development during the past 28 years that now the search for raw material has become the primary concern.

There are 3 techniques for collecting seaweeds:

1. From May to October, at low tide, people who live near the coast tear the seaweed off the rocks to which they are fixed. They are then spread on the beach and exposed to air and sun. The dried material is then sold to seaweed processors.

This system is used principally along the Galician coast and the coast of Spanish Sahara. This selective picking of seaweed offers a product of very high quality because only the species desired is collected.

2. Another harvesting technique involves frogmen. They operate from specially fitted ships from May to October. Although this technique is rather expensive, it results in the collection of higher quality seaweed.

This system has only been used during the past 10 years. During this period, extensive training and equipping of ships have been emphasized. Normally, ships 30 to 50 feet long are used, with 4 frogmen, a skipper, and one mechanic. By Spanish standards, the frogmen are extremely well paid. At the present time, over 100 ships of the above type are being used to collect seaweeds, almost exclusively the Gelidium species.

3. Finally, the most important procedure for gathering seaweeds is to pick them up on the beaches after they have been deposited by the autumn and winter storms.

The primary drawback to gathering storm-cast seaweeds is the necessity to sort out the undesirable species that collect on the beaches. Another drawback is the irregularity with which the storm-cast seaweeds are available. In one year, many tons may be washed ashore; in the next year, there may be nothing. This makes it difficult to maintain a labor force. In addition, storm-cast seaweeds are usually predominant in areas of high rainfall and humidity, and this makes drying difficult. To overcome this problem, the seaweed is usually transported to dry areas, such as the Castilian plateau in the interior. Of all seaweed collected in Spain, 70 to 80 percent is obtained through the storm-cast route.

Types of Seaweed Gathered

The industrial raw materials of the Spanish coast are represented by Gelidium, raw material for the manufacture of agar-agar; Lichen carrageen for carrageenan, and Laminaria for alginates. Other seaweed species are also collected, though in small quantities: for instance, Fucus for the manufacture of animal fodder.

Almost all available seaweeds are located along the north and northwest coasts. There is an appreciable amount in the Spanish Sahara and a small amount around the Canary Islands.

Processing Facilities

During 1940-1945, two small plants manufacturing agar-agar for their own use were constructed. These were Institute IBYS and Instituto Lorente. The latter was later converted to Productos Naturales Y Sintenticos, S.A., Prona.

During 1945-1950, two plants were erected and began production on a commercial scale: Explotacion De Algas, S.A., and La Techica Quimica Hispana, S.A.

From 1950 to 1955, two additional agar-agar companies were founded: Productos Quimicos Drovecol and Elaboracion De Productos Alimenticas Basicos, S.A.

From 1955 to 1960, another pair of commercial processing plants emerged on the scene: Productos Quimicos Navis, S.A., and Productos Y Derivados Marinos, S.A. During 1960 to 1965, the largest increase in production of agar-agar was obtained, 800 tons per year. Since 1965, six new companies have been formed for the commercial production of agar-agar. These are Sanval, Juste, Ceamsa, Movogel, Gummagar, and Roko.

In 1966, eight agar-agar processing firms formed a group under the name Hispanagar, S.A., which is now erecting a new plant in Burgos. Production capability is 1,250 tons a year. This plant initiated production at the end of 1968.

The primary problem the seaweed industry now faces is obtaining enough raw material to keep the plants in operation. The total capacity of all plants is now 1,800-2,000 tons annually; actual production was 890 tons in 1965, 600 tons in 1966, and 925 tons in 1967. This means that Spanish agar-agar plants have been operating at only about 42 percent of total capacity.

CARRAGEENAN--The processing of carrageenan from Carrageen lichen is insignificant. Almost all of the 300 to 600 tons of raw weed have been exported. In view of the increasing consumption of products derived from lichen in Spain, as well as in international markets, two companies are now constructing plants for commercial production of carrageenan. These plants are being constructed in Vigo and Burgos; proposed annual production is 400 and 180 tons, respectively. It is expected that these plants will absorb all the lichen seaweeds that can be gathered.

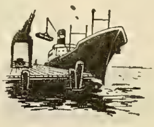
ALGINATES--The alginate industry is relatively new. The first efforts to produce this valuable material was tried in 1950, when an agar-agar manufacturer began a study of the possibility of extracting alginates from the Laminaria species, flexicaulis, claustroni, and sacorriza. He found the first two suitable for alginate production. In 1954, a small plant was installed, and he began producing sodium alginate. Even though the quantities produced were small, they were sufficient to supply the local market. One principal difficulty is obtaining sufficient raw material because Laminaria is collected by hand on rocky coasts. This contrasts with the massive mechanical harvesting techniques used by the U.S.

In 1959, the first independent alginate industry was developed. This industry, situated at Ribadeo, Province of Lugo, has an annual capacity of 120 tons of alginic acid. It produces primarily sodium, calcium, and ammonium alginates. The products are sold on the local market, but meet with difficulty on the international market due to the high cost of the raw material.

Marketing Seaweed Products

Spain is the second largest producer of agar-agar in the world, exceeded only by Japan. However, the domestic use of agar-agar in Spain is not significant. Therefore, 85 to 90 percent of the agar-agar produced is exported to the U.S., England, Germany, Czechoslovakia, USSR, Italy, and Poland. Spain is the largest exporter of agar-agar in the world.

The collection of seaweeds is regulated by a decree of the Ministry of Commerce. It grants permits to manufacturers of seaweed derivatives for collection and acquisition of seaweeds in each area of the Spanish coast during a specified period.



France

BUYS JAPANESE LONGLINER FOR INDIAN OCEAN TUNA BASE

The French CIAP Corporation placed a 200-million-yen (US$556,000) order in July with the Japanese fish net and gear manufacturer Nippon Gyomo Sengu Co. for a 400-gross-ton double-deck longliner. The vessel is scheduled to be used in the Indian Ocean from the tuna base at Réunion Island. The island is a French possession about 400 miles east of Madagascar, and near Japanese tuna base at Port Louis, Mauritius Island.

CIAP Corp.

CIAP is a semigovernment corporation established in Saint Denis, Réunion Island, in late June 1969 with capital of about 100 million CFA franc (about $400,000). It was formed to develop a tuna base in the Indian Ocean in line with EEC common fishery policy of promoting the tuna fisheries.

Growth Plans

Initially, experimental fishing will be conducted with one longliner manned by natives and, eventually, fleet will be increased to 10 vessels. The catches will be delivered to tuna packers in France. At present, 30 Japanese longliners and about 80 Taiwanese and 20 South Korean tuna vessels are fishing in the Indian Ocean. ('Suisancho Nippo,' July 10 & 11.)

* * *

FISHERY IMPORTS FROM COMMUNIST COUNTRIES DECREASE

French fishery imports from Communist countries decreased considerably during first 3 months 1969 from last 3 months 1968. Imports of canned crustaceans from the Soviet Union decreased to 556 metric tons in first-quarter 1969 from 1,125 tons in last quarter 1968. The 1969 value was 5.8 million francs against 15.5 million (about US$1 million against $3 million). Average value of one ton of Soviet crustacean imports decreased from 13,800 to 10,450 francs. Imports of "fresh and frozen crustaceans" from Cuba decreased from 540 tons in 1968 to 320 tons in 1969. The unit price was stable at 13,500 francs a ton in both quarters. (U.S. Embassy, Paris, June 4.)

* * *

TUNA LANDINGS FOR PACKERS DECLINED IN 1968

In 1968, yellowfin tuna landed in French ports, for delivery to packers, totaled 9,100 metric tons--compared with 11,500 tons in 1967. Imports were 2,100 tons (1,000 tons in 1967). This information is provided by the representatives of the Japan External Trade Organization stationed in Paris from the report on fish canning by the French Fisheries Section of the National Canning Industrial Professional Committee.

Landings & Imports

Domestic landings and imports of 11,200 tons (12,500 tons in 1967) represented 9,700 tons (10,900 tons) of canned product. Tuna shipments from Africa to French canneries totaled 27,500 tons (19,900 tons) in landed weight and 20,000 (14,200 tons) in equivalent canned tonnage. In addition, 11,000 tons of canned tuna were packed in Senegal during 1967-68, compared with 8,900 tons during 1966-67. ('Suisan Tsushin,' July 11.)

Denmark

FAROESE FRESH FISH DELIVERIES TO BRITAIN DECLINE

Faroese fishery exports to Great Britain have declined appreciably. During the first four months of 1969, total deliveries were 758 tons valued at US$168,000, less than half the value of a few years ago. During March 1969, one vessel's catch of about 22 metric tons of iced fish was delivered to Aberdeen, Scotland. It was valued at less than US$3,500.

Causes of Decline

Causes of the decline include: (1) reorganization of fishing operations for herring, and (2) fish are being filleted and frozen for sale to the U.S. The prices obtained in the U.S. are higher than those paid for fresh fish in Great Britain.

The Faroe Islands are beginning to create a profitable frozen fish market in Sweden. ('Dansk Fiskeritidende,' June 6.)

Sweden

SHRIMP IMPORT REGULATIONS AFFECTED BY KENNEDY ROUND

Fresh, chilled, frozen, dried, or salted shrimp, whether peeled or not, and unpeeled shrimp boiled in water are duty free. The duty on other shrimp is $5\frac{1}{2}$ U.S. cents a lb. This rate is affected by the Kennedy Round. According to customs authorities, it will change on Jan. 1, 1970, to: 1970--$4\frac{1}{2}$ cents; 1971--4 cents; and 1972--$3\frac{1}{2}$ cents.

Some Imports Licensed

Imports of unpeeled shrimp boiled in water were licensed Mar. 1, 1969. The licensing requirement does not now involve automatic quantitative restrictions; all license applications have been granted. Possible reasons for denials include unreasonable quantities or unrealistic pricing. The National Agriculture Board continues to study the question of shrimp imports. Controls on this trade are not contemplated soon. Imports of licensed shrimp, Mar. 1-July 1, 1969, were US$2.9 million, compared with normal annual imports of US$1.9 million.

Color Additives

No special sanitation requirements concern imports of U.S. or other shrimp; they are not subject to inspection procedure. Some color additives are approved for preserved shrimp and boiled peeled shrimp to be frozen. (In the latter, provided it is sold to ultimate purchaser in original container clearly showing color additives were used.) Only Poncean 4R (Color Index No. 16255) is presently permitted for other boiled shrimp. U.S. preserved shrimp will, in other respects, meet Swedish requirements.

Icelandic Fish Imported

The distribution of Icelandic fresh (not frozen) shrimp, air shipped to Stockholm, has just started. The high-quality shrimp will cost about same as U.S. shrimp. Due to poor herring catches, Icelandic fishermen have become more interested in shrimp fishing, which has not been tried to any great extent. The fishing is convenient to western Iceland.

Longer U.S. Season Possible

Swedes are surprised that U.S. shrimp fishing ends during warm season. It seems U.S. summer catches yield poor-quality shrimp with high water content. However, experience in Sweden and Canada indicates high-quality U.S. shrimp could be found during warm season in deeper and cooler water. (U.S. Consulate, Goteborg, July 7.)

Norway

EXPEDITION TO TAKE PART IN ANTARCTIC WHALING

Two small Norwegian whaling expeditions are planned for the coming (1969/70) season's Antarctic whale hunt. Experienced whale gunners in the Sandefjord area plan to equip a 2,500-GRT factoryship and one whale catcher. Another vessel, a 175-foot-stern trawler (900 GRT), is expected to be finished before the fall. It is financed partly by a US$250,000 loan from the District Development Fund. Its owner has been promised a concession for Antarctic whaling. This would indicate government interest in resuming whaling in those waters.

To Hunt Finbacks & Sei

The 2 expeditions plan to hunt finbacks (*Balaenoptera physalus*) and sei whale (*Balaenoptera borealis*). Both species are covered by international quota. There are plans to hunt also the smaller bay whale (*Balaenoptera acutorostrata*) and market its main product, whale meat, in the U.K., Japan, and possibly Norway.

Approves Whaling Commission Action

The Ministries of Foreign Affairs and Fisheries are satisfied with outcome of recent meeting of the International Whaling Commission (IWC) in London. The reduction in the Norwegian Antarctic whaling quota by 500 units to 231 blue-whale units reflects the current status of Norwegian whaling; nevertheless, it maintains basis for possible new (small-scale) development of Norwegian whaling in the Antarctic. An official asserted that unilateral reduction of Norwegian Antarctic blue-whale quota for 1969/70 season will not prejudice future Norwegian quotas. (U.S. Embassy, Oslo, July 15.)

* * *

Norway (Contd.):

SALMON CATCHES DROP

Norway's catch of salmon and sea trout decreased 21% from 1967 to 1,618 metric tons in 1968, according to preliminary data of the Central Bureau of Statistics. As in previous years, nearly all of the 1968 catch was in Norwegian waters: 276 tons in rivers, 1,342 tons along coast.

The good catches of salmon in the last few years by foreign vessels in international coastal waters attracted about 100 Norwegian longliners this spring. This offshore fishery ended in late June. It yielded a Norwegian catch officially estimated at about 400 tons. About 40% of the fish were small (2-6 lbs.); the quality was generally fair.

Inland Waters

No data are available for the current fishing season in inland waters. The season is limited by law to May 1-Aug. 4. Reportedly, salmon fishing has been extremely poor. The large salmon--the angler's trophy and bearer of highest market price--has failed to appear. The large salmon normally enters Norwegian rivers in its mating run before midsummer.

Overfishing Charged

The reduced 1968 catches and the poor ones so far this year have provided ammunition to proponents of banning salmon fishing in international waters. One government fishery specialist believes that the complete failure of the 1969 salmon fishery in Norwegian rivers undoubtedly reflects overfishing in international waters. There is no reason to assume salmon fishing will improve, he said. From now on, only smaller salmon can be expected to enter the rivers.

Union Disagrees

This conclusion may be premature. According to 'Fiskaren,' organ of the Fishermen's Union, June 23, exceptionally large schools of salmon, including large ones, had been observed in the fjords of Sunnmøre on west coast. If this is correct, and similar developments are pending, perhaps the salmon have only been delayed in their mating run up the rivers. (U.S. Embassy, Oslo, June 28.)

* * *

INTEREST IN GEORGES BANK HERRING FISHERY GROWS

Norway's largest factoryship, 'Gadus,' owned by a major Oslo shipping company, was scheduled to leave Norway in August for Georges Bank. The expedition is supported by the Fisheries Directorate in Bergen. It will explore those waters for possible exploitation. The Gadus has a production capacity of about 800 tons of frozen fillets.

Reportedly, frozen herring fillets are in short supply in European markets. Norwegian interest in exploiting the Georges Bank herring resources has been evident for months.

Possible Fishery

A successful expedition to Georges Bank could lead to limited direct Norwegian participation. Large-scale operations, involving purse-seining for reduction purposes, appear unlikely. This is because of the distance to Europe and the questionable profitability of floating fish-reduction plants.

Canadian Interest

Indirect participation in fishing for reduction purposes seems more likely. Canadian fishing interests are negotiating the charter of 30 to 40 Norwegian purse seiners. A substantial part of the Norwegian purse-seine fleet is now idle or engaged in other fishing operations due to reduced shoalfish stocks (compared with last year).

Also, 'Fiskaren,' July 3, reports that the largest Canadian fish-reduction company has ordered a complete factory from Stord Bartz Industri A/S. The plant will be erected in Newfoundland. It will have daily capacity of 1,000 metric tons of raw fish. This reduction plant will be the 14th delivered by Stord Bartz Industri A/S to Canada in the last 4-5 years. (U.S. Embassy, Oslo, July 22.)

Hungary

FISH PONDS YIELD MORE FISH

Farmers in Hungary have found a new way of producing more fish, fowl and grain. They dig ponds. The practice began as an experiment about a decade ago. It is being carried out on a growing scale by farm and fishery cooperatives in various parts of the country, especially where the land is poor.

Stocked With Carp & Duck

The farmers build large ponds and stock them with several varieties of carp (a popular fish in Eastern Europe), eel, and Long Island duck. The ponds vary in area from several acres to several hundred acres. They average four feet in depth.

The carp help satisfy consumer demand in their land-locked country. Hungary now derives 80% of her 30,000 ton annual fish production from ponds. Much of the duck, and almost all the eel, are exported.

Planted With Grain

The carp and duck are carefully tended, harvested, and sent to market. Then the ponds are drained, and rice, maize, and other crops planted. Resulting harvests are up to 20% higher than for similar crops grown elsewhere in the country. The high sodium soil has been improved by the action of the water and fertilized by the carp and duck droppings.

Continuous Production

After each harvest, the ponds are reflooded and the process repeated, generally on a 3- to 5-year cycle. This establishes a continuous chain enabling the same plot of normally unproductive land to yield fish, fowl, and crops. The system is efficient and economical, and requires few attendants.

Ancient Principle

The principle is an ancient one. It was known to Chinese farmers who achieved "balanced" ponds, harvesting the grass and weeds to feed the pigs and cattle that fertilized the ponds. ('FAO News.')

Switzerland

IMPORTS FISH MEAL

Despite her small size and relatively small population, Switzerland imports significant quantities of fish meal. Peru retained her position as chief supplier during the first quarter of 1969, followed by Chile, Norway and Denmark. Whether advantages to be gained by Denmark and Norway through their European Free Trade Association status will change this balance remains to be seen. (Agricultural Attaché, U.S. Embassy, Bern, June 20.)

	Jan.-Mar.		12 mos.
	1969	1968	1968
	. . . (Metric Tons) . . .		
Peru	8,423	4,519	14,361
Norway	2,008	1,492	5,040
Denmark	1,888	2,720	12,264
Chile	1,785	3,387	11,892
Ethopia	-	-	30
W. Germany	120	3	23
South Africa	-	-	373
Iceland	-	370	857
France	-	60	340
Total	14,224	12,551	45,180

West Germany

INTERNATIONAL SYMPOSIUM ON CULTIVATION OF MARINE ORGANISMS

"International Helgoland Symposium, 1969" on "cultivation of marine organisms and its importance for marine biology" will be held at Helgoland, West Germany, Sept. 8-12, 1969.

The symposium sponsors hope it will help to assess the present status of knowledge on cultivation of marine organisms, point out important problems to be solved and neglected areas of cultivation research, and provide solutions to difficult methodological problems. Papers will be presented on microorganisms and plants, animals, and ecosystems. Informal sessions on fish-farming and cultivation of plankton populations will be held.

For further information: contact the Director, Biologische Anstald Helgoland, 2 Hamburg 50, Palmaille 9, Federal Republic of Germany. ("International Marine Science," April.)

LATIN AMERICA

Cuba

ELECTED TO UNDP GOVERNING COUNCIL

Cuba was elected to the UN Development Program (UNDP) Governing Council in early June 1969 by secret ballot of the 27-member UN Economic and Social Council (ECOSOC). Cuba is not a member.

UNDP Governing Council was formed in 1965 to coordinate and consolidate all UN technical aid and development programs. Its 37 members exercise direct policy control over the programs.

Only 3 (ECOSOC) members are from Communist countries: USSR, Bulgaria, and Yugoslavia. Since all 5 members from South America (Argentina, Guatemala, Jamaica, Mexico, and Uruguay) had opposed Cuban election, votes must have come from Asian and African delegates.

Edges Out Argentina

Cuba was elected by a vote of 14 to 13 over Argentina, the South American candidate preferred by other Latin American nations. Mexico, favored by the U.S. and Latin Americans, also was elected.

Fishing Industry Expands

In the world of fishing, Cuba's election may be more significant than in the political world. Cubans are rapidly expanding their fishing industry. In the past they received considerable aid from UN. They may apply for more.

CORRECTION

Dr. J. W. DeWitt, author of "Pacific Salmon Introduced into Southern Streams" (of Chile), CFR July 1969, p. 58, has asked that end of next-to-last paragraph be changed to read: ". . . to spawn in the Chilean fall of 1971."

SOUTH PACIFIC

American Samoa

TUNA PRICE IS UNCHANGED

Tuna delivery prices at American Samoa for July 1969 were the same as June's, according to an agreement reached between Japanese suppliers and U.S. packers.

The July delivery prices per short ton were: round albacore: frozen US\$425, iced \$410; gilled and gutted yellowfin: frozen \$342.50, iced \$322.50.

The Japanese had asked for a \$5-a-ton increase for albacore. ('Suisan Tsushin,' July 12.)

Western Samoa

SEEKS JAPANESE FISHERY AID

Western Samoa's Prime Minister Mata'afa visited Japan June 15-30 at the invitation of the Japanese Pacific Ocean Society. He indicated his wish to receive technical fishery assistance. Western Samoa, with around 145,000 people, wants to build her fishing industry on the Japanese pattern and is looking to Japan for capital investments.

Japanese Investments

Prime Minister Mata'afa also requested that Japan approve the investment planned in Western Samoa by Taisho Shamitsu Industries, Ltd. In February 1969, that firm was licensed by Samoa to establish a corporation.

The Japanese firm plans to invest 100 million yen (US\$278,000) to build a 100-ton cold storage--and to operate two 20-30-ton fishing vessels for pole-and-line and gill-net fishing, primarily for lizardfish. Japan's Fisheries Agency plans to send a survey mission to Western Samoa. ('Shin Suisan Shimbun,' July 7.)

ASIA

Japan

SALMON MOTHERSHIP FLEETS END FISHING

The 11 Japanese salmon mothership fleets (11 motherships and 369 catcher vessels) fishing in Area A (north of 45° N. latitude) in the North Pacific were scheduled to end operations between July 21 and 23. They were expected to have caught their quotas. The end would come about 8 days later than in 1967, the previous good pink salmon year, due to the unexpectedly light run of reds and chums. These caused the fleets to shift frequently.

Runs Near Shore Heavier

The salmon runs closer to shore were heavy compared with high-seas runs. So the land-based gill-net and longline fleets, which operated in Area B (south of 45° N. latitude), fared well. Fishing in Area B ended June 15 for longliners, and on June 23 for gill-netters. ('Suisan Keizai Shimbun,' July 16.)

* * *

SUMMER ALBACORE FISHERY NEARS END

As of June 30, the Japanese summer pole-and-line albacore tuna catch was 27,500 metric tons. The fishery was near the season's end. Catches after that date were averaging around 50 tons a day of albacore mixed with skipjack.

As of June 30, landings of pole-caught albacore at principal ports were about: central Japan: 16,100 tons Yaizu; 5,800 tons Shimizu; 600 tons Misaki; 500 tons each Numazu and Choshi; southern Japan: 400 tons Kogoshima; northern Japan: 1,700 tons Nakaminato; 800 tons Onagawa; 250 tons Kesenuma; and 200 tons Ishinomaki.

Landings Above 1968's

Landings this year are substantially above the 1968 season's 17,300 tons--but are not likely to reach the 30,000 tons of 1967. ('Suisan Tsushin,' July 12.)

* * *

EXPLORATORY TRAWLING IS DISAPPOINTING IN NORTHEAST ATLANTIC

The stern trawler 'Akebono Maru No. 51' (1,454 gross tons) is in the northeast Atlantic on a government-subsidized resource survey cruise. She recently completed fishing tests in the Bay of Biscay with little success. The vessel reported that the Bay has an abundance of cod and herring, but practically none of the species sought by Japan--octopus, squid, and red sea bream.

Akebono Maru is scheduled to extend operations northward toward the west coast of England for the second part of her cruise. However, the trawler's operators do not anticipate promising results. ('Minato Shimbun,' June 12.)

* * *

TRAWLERS FACE CANADIAN RESTRICTIONS

The Japanese Fisheries Agency says Canada intends to declare as internal waters the landward side of the baseline connecting Vancouver Island and the Queen Charlotte Islands immediately after legislation is enacted around September. On June 11, Canada announced straight baselines. She defined her territorial sea and fishing limits along the coast of Vancouver Island and Queen Charlotte Islands on the west coast, and Nova Scotia on the east coast.

Negotiations May Be Necessary

Japan points out that Canada's claims will shut out Japanese trawl operations; already, these have been adversely affected by adoption of straight baselines. It might be necessary to negotiate with Canada for a fishery agreement similar to the one with the U.S.

The area to be affected by Canada's declaration is used now by Japanese trawlers primarily to load, although 1 or 2 trawlers also fish between the 2 islands.

Japanese Position

Japan has ratified the Convention on the Territorial Sea and the Contiguous Zone. She cannot protest the straight baseline system

Japan (Contd.):

recognized by that Convention. But she considers exclusion of foreign fishing vessels in the internal waters defined in connection with the straight baseline system as internationally illegal. Therefore, she plans to contact the Canadian Embassy in Tokyo about the matter. ('Minato Shimbun,' July 6.)

* * *

TUNA PURSE SEINING FAILS COMPLETELY IN EASTERN PACIFIC

Japanese purse-seine operators were shocked to learn that the 4 tuna purse seiners that sailed in early January for the first time to the Eastern Pacific took only 340-350 tons. All 4 left the grounds between late April and early May. One Taiyo vessel and one Kinkai arrived in Japan at the end of May; the remaining two were en route to purse seine off Africa.

Last Year's Method Fails

Last year, a Kawajiri Gyogyo vessel took nearly 1,000 tons of yellowfin from the same area. This year's plans of the 4 purse seiners were based on the same method. The result, however, was complete failure.

Only Japanese Failed

Each U.S. purse seiner uses 3 or 4 speed boats to herd dolphin-chasing yellowfin into a net. Japanese purse seiners have no speed boats and cannot keep up with yellowfin. The Japanese failure, while catches by other countries were high, shocked Japanese fishermen. ('Shin Suisan Sokuho,' May 10.)

* * *

TO SURVEY SKIPJACK TUNA IN SOUTHWEST PACIFIC

Japan is planning an extensive skipjack resource survey in the southwest Pacific, from Palau Island (U.S. Trust Territory) to south of New Guinea. The survey is to determine the potential for a pole-and-line skipjack fishery in the southern region, and to develop ways of keeping baitfish alive in the wells. The latter is a problem previously considered impossible to overcome.

Chartered Survey Ship

The modern skipjack vessel 'Seishu Maru No. 7' (345 gross tons) will be chartered to conduct the survey from September or October until March 1970. The trip will be subsidized by the Mie prefectural government and supported by the Federation of Japan Tuna Fisheries Cooperative Associations. ('Katsuo-maguro Tsushin,' May 22 & 26.)

* * *

FROZEN TUNA EXPORTS TO U.S. DROP

Owing to short supply, and U.S. rejections since late 1968, direct exports of frozen tuna to the U.S. during Jan.-May 1969 were down to 8,376 short tons worth US$3,666,236. Exports during same period 1968 were 21,239 tons worth $9,786,554.

Quantity and value of Atlantic transshipments to the U.S.--9,442 tons worth $3,418,021 Jan.-May 1969--were about the same as 1968 transshipments: 9,519 tons and $3,065,667. (Figures include tuna loin exports.)

Domestic Packers Bought Much

May albacore exports to the U.S. amounted to 1,357 tons of direct shipments and 527 tons of Atlantic transshipments. Normally, June is the peak month for albacore exports, but this year's June shipments, as of the 15th, were only about 1,000 tons. Practically all the summer albacore taken off Japan were bought by domestic packers at high prices. There may not have been much left for export. ('Suisancho Nippo,' June 17.)

* * *

HIGHER PRICES FIXED FOR CANNED TUNA EXPORTS TO U.S.

On July 8, the Tokyo Canned Tuna Sales Co. resumed sales of canned tuna-in-brine for export to the U.S. after a temporary suspension. It announced that a premium would be added to the present price for all can sizes.

The Sales Company will not apply the "fall clause" (contract provision to adjust prices in case of price decline) to the premium

Japan (Contd.):

added. The quantity for sale was not announced, but it was speculated that about half the stock of about 200,000 cases (mostly whitemeat tuna packed in 7-oz. cans) would be offered during a one-week period. The price and premium are shown below. ('Suisan Tsushin,' July 10.)

Style of Pack	Can and Case Size	Present Price 1/ Per Case	Premium Per Case
		. . . . . (US$)	
Canned whitemeat tuna in brine:			
Solid:	7-oz. 48's	11.11	0.28
	13-oz. 24's	10.33	0.28
	$3\frac{1}{2}$-oz. 48's	6.66	0.17
	$66\frac{1}{2}$-oz. 6's	12.33	0.42
	6.6-lb. 6's	21.17	0.83
Flake:	$6\frac{1}{2}$-oz. 48's	8.11	0.20
Chunk:	6.6-lb. 6's	18.94	0.56
Canned lightmeat tuna in brine:			
Solid:	7-oz. 48's	8.49	0.14
	13-oz. 24's	7.86	0.19
	$3\frac{1}{2}$-oz. 48's	5.11	0.08
	$66\frac{1}{2}$-oz. 6's	9.30	0.28
	6.6-lb. 6's	15.98	0.55
Flake:	$6\frac{1}{2}$-oz. 48's	6.13	0.10
Chunk:	6.6-lb. 6's	14.29	0.35

1/Ex-warehouse, Shimizu, Japan.

* * *

CANNED TANNER CRAB EXPORT PRICES UP

The Japan Canned Salmon and Crab Sales Company announced 1969 export prices for canned tanner crab. The company also conducted its first tanner crab sales. About 25,000 cases were sold to trading firms for delivery in June and July. ('Suisan Tsushin,' June 5.)

Export Prices, 1969 and 1968

Can Size	Choice		Standard	
	1969	1968 1/	1969	1968 1/
	. . . . (US$/Case)			
$6\frac{1}{2}$-oz. 24's	12.65	9.95	12.40	9.70
$6\frac{1}{2}$-oz. 48's	25.00	19.60	24.50	19.10
$3\frac{1}{4}$-oz. 48's	13.50	11.80	13.25	11.55

1/In 1968, promotion allowances also were offered to trading firms.

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FROZEN SHRIMP IMPORTS HIT HIGH IN MAY

In May 1969, Japan imported 4,232 metric tons of frozen shrimp worth about US$10.5 million. Although below April purchases of 4,817 tons worth $11.6 million, May imports exceeded 4,000 tons for the second time this year. India, Mexico, Thailand, Hong Kong, Pakistan, and Taiwan were the leading suppliers. ('Suisancho Nippo,' June 19.)

Frozen Shrimp Imports, May 1969

Origin	May 1969 Quantity	May 1969 Value	Jan.-May 1969 Quantity	Jan.-May 1969 Value
	Metric Tons	US$ 1,000	Metric Tons	US$ 1,000
India	640	1,353	1,776	3,608
Mexico.	618	1,842	2,662	7,247
Thailand.	519	1,203	2,678	6,050
Hong Kong	442	1,331	1,267	3,644
Pakistan	304	764	953	2,275
Indonesia.	298	739	841	1,936
Taiwan.	215	358	643	1,067
Australia	158	478	309	894
Kuwait.	132	350	386	858
Sabah (ex-North Borneo) .	114	250	598	1,250
Malaysia	111	236	468	1,042
Others	681	1,554	5,087	12,501
Total	4,232	10,458	17,668	42,372

* * *

GEAR LOST OFF MEXICO

Data collected by the Federation of Japanese Fisheries Cooperative Associations (NIKKATSUREN) show that, since July 1968, 8 longliners lost 13 cases of gear while fishing off Mexico. Some 178 baskets of longlines (1 basket is 650-1,300 feet of line), 249 glass floats, 19 lamps, and one radio buoy were lost or damaged. Most of the longlines were severed by sharp instruments; 41 glass floats were damaged by rifle bullets. The vessels reported that the offenses were committed by small 40-50 ton purse seiners which fled into territorial waters when pursued.

To Tell Mexico

NIKKATSUREN plans to submit the data to the government, requesting that Mexico be reminded of these incidents at the forthcoming meeting on the Japan-Mexico fisheries agreement.

During April-July 1968, 13 Japanese longliners fishing off Mexico suffered 13 cases of gear theft. They lost 418 baskets of long

Japan (Contd.):

lines, and 443 pieces of radio buoys, glass floats, banners, and lamps. ('Katsuo-maguro Tsushin,' June 18.)

Taiwan

TUNA FISHERIES ARE IN TROUBLE

Taiwan's tuna fisheries are beset with difficulties--despite a record 1968 tuna catch of 79,000 metric tons (nearly 3 times the 1965 catch) and tuna exports to the U.S. worth US$25 million (only $2 million in 1965). Over half the vessel owners are unable to repay loans or modernize fishing gear and equipment.

The situation is expected to worsen with delivery of twenty 250-ton tuna vessels built in South Korea and financed from a $14.4 million loan granted Taiwan by the World Bank in 1967. Forty similar vessels will be built in Taiwan with a $10 million loan recently approved by the Asian Development Bank.

While production costs are rising, world market prices for tuna have stabilized in recent years.

What Taiwan Needs

The tuna fishery also lacks well-trained and experienced skippers and crews. It has poor marketing facilities. It depends almost entirely on Japan for bait and fishing gear.

Because of these problems, the Chief of the Fisheries Division of Taiwan's Joint Commission on Rural Reconstruction has recommended postponement for a few years of the planned expansion. (U.S. Embassy, Taipei, June 13.)

* * *

EXPORTS AND IMPORTS FISHING VESSELS

The Nantai Shipbuilding Co. of Taiwan has won a contract to build fishing vessels for a Chinese firm in Indonesia.

Prices were: (1) US$175,000 for a 200-gross-ton, distant-water, vessel with main engine, freezer compartment, communication devices, and radar; (2) $30,000 for a 30-gross-ton coastal fishing vessel with engine, navigation instruments, and fishing gear.

Hong Kong Intermediary

The contract was negotiated through a Chinese merchant in Hong Kong because Indonesia does not have diplomatic relations with Taiwan. The Chinese firm in Indonesia learned that Taiwan builds as well and more cheaply than other countries. Before, all large Indonesian fishing vessels were imported from Japan.

Buys from S. Korea

The S. Korean Commerce and Industry Ministry reportedly has concluded a US$6.14 million contract with the Taiwan Central Trust Bureau to export twenty 250-gross-ton tuna vessels to Taiwan. The vessels, now being built at S. Korean shipyards, were scheduled for delivery by the end of August 1969. S. Korea hopes contract will lead to vessel orders from other countries. ('Suisan Keizai Shimbun,' June 6 & 16.)

According to information from the U.S. Embassy in Taipei, the 20 tuna vessels are financed by a World Bank loan to Taiwan in 1967. The contract with S. Korea was concluded then.

* * *

REQUESTS OBSERVER STATUS AT IPFC MEETINGS

The Republic of China (Taiwan) has asked to participate as an observer at meetings of the FAO Indo-Pacific Fisheries Council (IPFC). The Council voted 14 to 10, with 4 abstentions, in favor of the request. Taiwan withdrew from FAO membership in 1952.

The IPFC was started in 1948 and has 18 members. Taiwan accounts for about 10% of total annual catch in Indo-Pacific area. (FAO, June 19.)

South Korea

VALUE OF FISHERIES IS INCREASING RAPIDLY

In first-half 1968, the value of South Korea's fishery output was 9.3 billion won (US$33.2 million), or 2.1 percent of her gross national product (GNP). ('Korean Business Review,' Dec. 1968.)

The fishery contribution to the GNP remained the same in 1968 as in 1967 because the entire economy grew as fast as the fisheries. In first-half 1968, fishery output increased 16.4% compared to 1967 production value of 8 billion won ($28.6 million). The GNP in the first half of 1968 grew at a rate of 17.2%. Both rates are practically unmatched in world economies.

Latest estimates by the Ministry of Agriculture indicate value of 1968 fisheries exceeded 18.5 billion won (US$66 million) in constant 1965 prices.

* * *

TO EXPORT TUNA LONGLINERS TO EL SALVADOR

S. Korea plans to build and export in 1969 11 tuna vessels (235 gross tons each) to El Salvador on a deferred-payment basis. The terms are US$338,738 per vessel payable in installments over 4 years. This includes a 1-year grace period. Interest rate is 7.75% a year. S. Korea will send 33 senior crew members (captains, radio operators, and engineers) to El Salvador to man vessels. ('Suisan Keizai,' Apr. 1.)

Sale Follows Survey

The sale follows the October 1968 agreement between Korean Office of Fisheries and El Salvador. The Korean Fisheries Mission visited El Salvador in March 1969. It recommended reorganization of fisheries programs, increase in staff and budgets, a Ministry of Fisheries to include research training and statistical collection, drafting of development plan, and organization of fishermen's training center.

Mission Recommendations

The Korean Mission recommended that all longliner tuna catches be frozen and sold on world markets because it could not find markets for tuna and allied fish in Central America. Also, it recommended establishment of a longline fishery rather than purse-seine or bait-boat fishery for tuna. The standard longline boat of 240 gross tons recommended agrees with reported tonnage of the 11 longliners ordered.

ARE THERE REALLY SEA MONSTERS?

Although we discount the fabled sea monsters, such as the kraken which could swallow vessels whole, we have not yet explored the ocean thoroughly enough to say with absolute certainty that there are no monsters in the deep.

Scientific observations and records note that giant squids with tentacles 40 feet long live at 1,500 feet and that sizable objects have been detected by explosive echo sounding at greater depths.

Oarfish 40 to 50 feet long also have been observed by scientists. Either the oarfish or the giant squid with its long tentacles may have given rise to the sea serpent stories told by sailors of old.

In recent years, Danish scientists have studied large eel larvae that would grow to 90 feet if their growth rate is the same as eels of other species. ("Questions About The Oceans," U.S. Naval Oceanographic Office.)

MID EAST

Israel

BROADENS OCEANOGRAPHIC WORK

Prof. Moshe Shilo has summarized Israeli oceanography and limnology. He is associated with the National Council of Research and Development.

The limnological laboratory at the Sea of Galilee now has adequate equipment and staff. The laboratory is nearly ready to study the lake's ecology, geology, microbiology, biology, and physical and chemical limnology.

Red Sea Station

The Marine Biological Research Station at Eilat is a going concern. Prof. Heinz Steinitz, Professor of Zoology, Hebrew University of Jerusalem, is slated to be named director.

Haifa Institute

Construction of the Institute of Oceanography and Limnology at Tel Shikmona, on the outskirts of Haifa, will begin in a few months. Scheduled for completion in 3 years, it will be the center for all major oceanographic research. It will include the Sea Fisheries Research Station.

Vessels

The sea-going oceanographic vessel 'Shikmona' is being outfitted for more extensive and sophisticated research. A catamaran has been purchased for in-shore investigations. Also, propeller-driven boats of the Florida Everglades type are on order to broaden investigations at Bardawil Lagoon, near El Arish, in Sinai.

A hydrographic, geologic, and oceanographic coast survey offshore to 100 kilometers, and from Lebanon to Port Said, has been completed. Although possible offshore deposits of petroleum were explored, its immediate purpose was to locate sand suitable for construction. Hydrographic maps are expected to be issued soon. (U.S. Embassy, Tel Aviv, July 5.)

Qatar

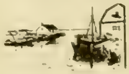
EXPORTS SHRIMP
TO U.S. AND JAPAN

Qatar is a small, oil-producing skeikdom on a Persian Gulf peninsula. Fishing is part of its economy. For the Qatar National Fishing Co., 1968 was an active year. (Its private investors hold 45%; government, 15%; Ross Group, 40%.) The company's modern refrigerated plant processed over 260 metric tons of shrimp. Processed shrimp now is being exported to the U.S. and Japan.

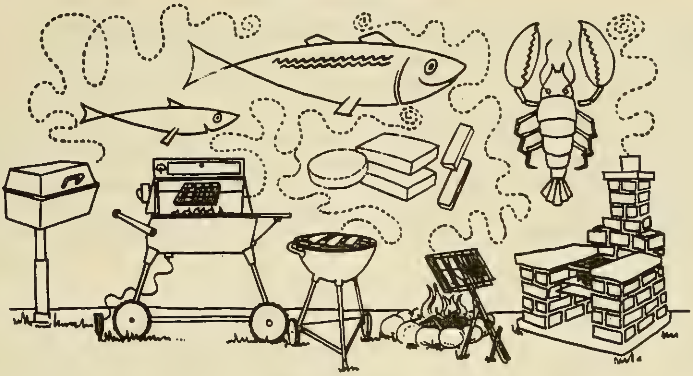
Progress in 1968

Significant strides were made in 1968 to improve Qatar's economy. The Doha Port Project awarded to the European consortium in 1967 was virtually complete at the end of the year. It includes a new 4-berth quay with an inner channel 1.5 miles long and 400 feet wide, and a maneuvering basin a half-mile square.

In April 1968, another contract estimated at US$204,000 was awarded to a Canadian firm for construction of two 200-foot span warehouses to provide 160,000 square feet of storage space. (U.S. Consulate, Dhahran, July 9.)



FOOD FISH FACTS



Outdoor Fish Cookery.

Thousands of people agree that food rarely tastes better than when properly cooked out-of-doors. The reason? Probably because the open air, the relaxed, congenial atmosphere, and the tantalizing aroma of outdoor cookery all combine to whet the appetite and sharpen the taste.

Fish and shellfish are no exception to this happy rule, and almost all varieties adapt readily to outdoor cooking and eating. Whether your equipment is a simple charcoal grill, an elaborate electric or gas grill, or a primitive campfire, the results can be equally successful and the eating equally good. The four important rules to remember for successful outdoor seafood cookery are:

1. Care in selecting and preparing the fish and shellfish;
2. Cooking the seafood until just flaky when tested with a fork. Overcooking of tender, succulent fish and shellfish is apt to toughen and dry them;
3. Controlling the heat; and
4. Marinating, basting, or coating the fishery products to keep the juices in and dryness out.

HOW TO BUY

Fish are marketed in various forms for different uses. Know these forms or "cuts" when you buy:

WHOLE - as the fish comes from the water. Before cooking, it must be eviscerated and scaled; usually the head, tail, and fins are also removed.

DRAWN - whole, eviscerated fish. Usually the head, tail, and fins removed.

DRESSED OR PAN-DRESSED - whole, eviscerated and scaled fish. Usually the head, tail, and fins are removed. Ready to use.

STEAKS - cross-section slices from large dressed fish. Ready to use.

FILLETS - sides of the fish, cut length-wise away from the backbone. Ready to use.

STICKS AND PORTIONS - pieces of fish cut from blocks of frozen fillets and having uniform sizes, ranging in weight from one to several ounces. Ready to use.

CANNED FISH - includes many varieties of both fish and shellfish.

(Continued following page.)

When ordering fresh or frozen fish or shellfish, tell your dealer how you plan to serve it. If you wish the head, tail, and fins removed from the whole or drawn fish, or if you wish the fish cut into serving-size portions, ask your dealer to do it. He will also open oysters or clams ready for serving--or shuck them ready for cooking.

HOW MUCH TO BUY

The amount of fish to buy per serving varies with the recipe to be used, the size of the serving, and the amounts of bone in the fish. Count about 3 ounces of cooked, boneless fish as a serving--a little less for small children and a little more for adolescent boys and men. The following table can help you decide how much fish to buy per serving:

Whole	$\frac{3}{4}$ pound	Portions	$\frac{1}{3}$ pound
Dressed or pan-dressed	$\frac{1}{2}$ pound	Sticks	$\frac{1}{4}$ pound
Fillets or steaks	$\frac{1}{3}$ pound	Canned	$\frac{1}{6}$ pound

Fish may be purchased fresh, frozen, and canned.

OPERATING A GAS GRILL

To light the grill--raise the hood or uncover. Remove grid, if manufacturer recommends. Strike long style match or light a soda straw. Turn gas valve to "high"--follow manufacturer's instructions if grill has pilot light. Hold match at ignition point.

Leave valve on "high" to preheat, but do not lower hood. If burner is below food, preheat for 10 to 15 minutes. If burner is above food, preheat for one minute.

Before placing food on grid or rotisserie, adjust valve to proper setting. Experience and personal preference will help you learn best setting. With outdoor grills, allow for climate conditions.

Follow manufacturer's directions for cooking on grid and rotisserie and for grill cleaning.

OPERATING A CHARCOAL GRILL

If your grill is of the charcoal variety, here's how to start the fire:

Line the bottom of the fire bowl with heavy-duty aluminum foil for easier cleaning later. To prevent the grill from burning out, line the bottom of the firebox with a layer of small pebbles or vermiculite. This permits the fire to breathe, giving more heat from the coals. Make charcoal layer slightly wider all around than the food to be cooked on the grill.

Start the fire sufficiently in advance so you will have a good bed of coals when you start barbecuing. One method used, which takes about 45 minutes, is to stack briquets in pyramid, and soak lightly with any recommended charcoal lighting fluid. Let stand 1 minute, then light. Many commercial forms of lighter fluid, easily ignited mats, and other lighting aids are available. WARNING: AT ALL TIMES TAKE NECESSARY PRECAUTIONS WHEN LIGHTING THE FIRE. NEVER USE GASOLINE! When the surface is covered with a gray ash, spread the coals evenly and the fire is ready.

FOR SMOKY FLAVOR

Wood chips from apple, oak, maple, hickory, and cherry give smoke flavor to fish. Soak chips in water at least an hour before using, so they will give maximum smoke and not burn too rapidly. On a charcoal grill, add a few chips at a time to the charcoal while cooking. If chips flame up, add more wet chips. For a gas grill, scatter wet chips directly on the ceramic briquets for added flavor, or--for a more subtle flavor--wrap them in perforated foil before placing them on the briquets.

REMEMBER

NEVER OVERCOOK FISH. Cook only until they flake easily when tested. (Source: National Marketing Services Office, BCF, U.S. Dept. of the Interior, 100 East Ohio, Rm. 526, Chicago, Ill. 60611.

(Recipe and photo pp. 75-6.)

FISH SQUARES ARE "IN" FOR THE "OUT" CROWD

Summertime--the weather is balmy and you want to be OUTSIDE. Well, summertime's the right time to forget formality--so, relax and enjoy life. Whether you're feeding the family or the boss, go ahead--now is the time to cook and eat outside where the breeze is soft and the sun is warm.

What could be simpler than ready-in-minutes fish portions cooked to perfection on a grill? Freezer-ready portions are great anytime of year and are especially appropriate in the summer when the less time spent cooking--the better! Whether you're planning a dinner on the patio, a picnic, or a camping trip, fish portions are right and ready, no muss--no fuss, just good eating.

The Bureau of Commercial Fisheries has a new recipe, "Charcoal Broiled Portions With Choron Sauce", which is great for special occasions. The Choron Sauce, a variation of world-famous Bearnaise Sauce, elevates the practical, good-every-day fish portion into the gourmet class. Quickly cooked corn on the cob and flavorful broccoli or other in-season vegetables complete the feast. Be sure to have plenty of fish portions on hand; they will be eaten almost as quickly as you can grill them.

Did you know that fish portions are generally made from groundfish which includes cod, haddock, and pollock? The tender, serving-size pieces are cut from frozen blocks of fish fillets and are 100 percent edible. Portions are always sold frozen and may be purchased breaded or unbreaded and either raw or partially cooked. They come in a variety of sizes and shapes to fit all needs. Keep frozen until ready to use, and cook without thawing. Fish portions may be baked, deep-fat fried, oven-fried, pan-fried, broiled, or charcoal broiled on a grill.

CHARCOAL BROILED PORTIONS WITH CHORON SAUCE

12 frozen raw breaded fish portions
($2\frac{1}{2}$ to 3 ounces each)
1 cup oil
Paprika
Choron Sauce

Dip frozen portions in oil and sprinkle with paprika. Place portions in well-greased, hinged, wire grills, cook about 4 inches from moderately hot coals for 5 to 7 minutes. Turn. Cook for 5 to 7 minutes longer or until fish are brown and flake easily when tested with a fork. Serve with Choron Sauce. Makes 12 servings.

Choron Sauce

$\frac{1}{2}$ cup butter or margarine
$\frac{1}{4}$ cup water
4 egg yolks
2 tablespoons tarragon vinegar
1 teaspoon instant minced onion
1 teaspoon dried parsley flakes
$\frac{1}{4}$ teaspoon salt
Dash cayenne
3 tablespoons tomato paste

Melt butter in water in top of double boiler over direct heat. Remove from heat. Add egg yolks. Beat until mixture almost doubles in bulk. Stir in vinegar, onion, parsley, salt, and cayenne. Cook over hot water 5 minutes or until thick, stirring constantly. Remove from heat. Stir in tomato paste. Serve warm. Makes approximately 2 cups sauce.

Want to know more about outdoor seafood cookery? The Bureau of Commercial Fisheries has published a 24-page, full-color booklet that is filled with information on how to buy and prepare fish, how to build and light the fire, and 36 wonderful recipes for your use. "Fish and Shellfish Over the Coals" (I 49.39:14) costs 40¢ and is available from the Superintendent of Documents, U.S. Government Printing Office, Washington, D. C. 20402.

(Source: National Marketing Services Office, BCF, U.S. Department of the Interior, 100 East Ohio, Room 526, Chicago, Illinois 60611.

FISH SQUARES ARE "IN" FOR THE "OUT" CROWD (Contd.)

FOOD FISH FACTS

Rainbow trout are known for the furious leaps and runs they make when caught in swift, cool, white-water rivers. These aerialists of the trout family are spectacular fighters and give a strong battle to fishermen.

DESCRIPTION

Rainbow trout are easily identified by the broad reddish band or "rainbow" which runs along the side of the fish from head to tail. The reddish band blends into a dark olive green on the back and pure white or silvery on the belly. The back, dorsal fin, and tail are generously sprinkled with black spots. The brightness of color varies with where the fish lives and what it eats. Rainbow sometimes migrate to the ocean where they spend several years of their life. When they return to their stream to spawn they have acquired a grayish tinge from the salt water and are called steelhead.

RAINBOW TROUT

HABITAT

The rainbow is a native of the Pacific slope of the Sierras from California to Alaska. It has since been transplanted to nearly every state in the Union. Trout prefer clear, cool, unpolluted water and are usually not found in waters without these qualities.

LIFE HISTORY

Wild rainbows usually spawn in the spring during their second or third year of life. The female deposits the eggs in the gravel of the streambed. The size of the female determines the number of eggs produced. In 8 weeks or more, depending on water temperature, the eggs hatch. The growth rate of the newly hatched fish varies and depends on such factors as water temperature, food supply, and water chemistry. From the many eggs deposited in the gravel, only a few young fish survive to adulthood. Therefore, relatively few trout reach catchable size to be taken by fishermen.

TROUT FARMING

Wise homemakers know, however, that they don't have to rely on the whims of nature to enjoy trout at mealtime. Modern trout farms raise their tempting fish for the tables of America. Using modern scientific equipment, trout farms create the best environmental and feeding conditions for fast-growing, healthy trout. Careful selective breeding has produced strains of rainbow trout that grow bigger and faster than their wild counterparts.

When grown to the correct size, these meaty delicacies are carefully selected for market. They are then cleaned and packaged for fresh or frozen distribution throughout the country. Modern technology is used in every phase from hatching to the finished package.

MARKET FORMS

Because of modern freezing and shipping techniques, frozen rainbow trout are available nationwide at almost anytime of the year. All trout are sold with head and tail attached. Frozen trout are sold fresh-frozen, boned, and boned and breaded. Boned trout have the backbone and ribs removed. Boned and breaded trout have the fins, backbone, and ribs removed. Frozen trout are usually sold in 8-ounce packages. Each package contains two 4-ounce trout.

Fresh trout, packed in ice, are also available in many areas. Those trout displayed in many seafood markets are usually 5, 6, 8, or 10-ounce fish. Trout of these weights are also tray-packaged by supermarkets to meet the needs of their customers. (Source: Bureau of Commercial Fisheries, U.S. Department of the Interior.)

(Recipe on p. 78.)

HOW ABOUT A TREAT WITH TROUT?

How about rainbow trout for dinner? Trout can be baked, deep fried, pan fried, broiled, poached, grilled, or barbecued. Any way you prepare them, rainbow trout are good eating.

For a special treat, try "Southern Baked Rainbow Trout," a new recipe from BCF. Bureau Home Economists took the goodness of trout and added one of the tastiest stuffings ever to come out of the deep South. After testing and retesting, they declared this recipe to be just the right combination to please the man of the house or those guests you want to surprise with something deliciously different.

Rainbow trout, a favorite of game fishermen because of their fighting spirit, are now available year round to all those fishermen who prefer to do their fishing at seafood counters. They are raised in great numbers in large ponds of cold, clear, running water on trout farms in the United States. The trout are fed carefully balanced diets and are hand-selected for market while they are still swimming. They are cleaned and packaged, fresh or frozen, minutes after being caught.

The flesh of rainbow trout is firm and white when cooked and is delicately flavored. It is high in nutritive value containing high quality, easily digested protein. Trout is also an excellent source of vitamins while being low in fat. Market forms include whole, dressed, filleted, boned, and breaded. For best results, thaw the trout before cooking and do not overcook. Frozen trout are usually sold in packages containing two 4-ounce trout. Fresh trout, packed in ice, are usually from 5 to 10 ounces in weight.

SOUTHERN BAKED RAINBOW TROUT

- 6 pan-dressed rainbow trout or other pan-dressed fish, fresh or frozen
- Salt
- Cornbread Stuffing
- 2 tablespoons butter or margarine, melted

Thaw frozen fish. Clean, wash, and dry fish. Sprinkle inside of fish with salt. Place fish in a single layer on a well-greased bake and serve platter, 16 x 10 inches. Stuff fish loosely. Brush fish with butter. Bake in a moderate oven, 350° F., for 20 to 30 minutes or until fish flake easily when tested with a fork. Makes 6 servings.

CORNBREAD STUFFING

- $\frac{1}{2}$ pound mild pork sausage meat
- $\frac{1}{2}$ cup chopped celery
- $\frac{1}{2}$ cup chopped onion
- 2 cups toasted cornbread cubes
- $\frac{1}{2}$ cup chicken broth
- $\frac{1}{2}$ teaspoon poultry seasoning
- $\frac{1}{2}$ teaspoon sage

Fry sausage meat until crumbly and brown. Add celery and onion. Cook until tender. Add remaining ingredients and mix well. Makes approximately 2 cups stuffing.

(Source: National Marketing Services Office, Bureau of Commercial Fisheries, U.S. Dept. of the Interior, 100 East Ohio, Room 526, Chicago, Illinois 60611.)

Today's modern homemaker knows the value of time. With her in mind, BCF has produced a full-color recipe booklet, "Time For Seafood." Fish and shellfish are natural timesavers and the booklet is filled with short, attractive, and flavorful recipes developed as the basis for quick, complete meals. "Time For Seafood," Fishery Market Development Series No. 12, is available for 45¢ from the Superintendent of Documents, U.S. Government Printing Office, Washington, D. C. 20402.

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As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States -- now and in the future.

UNITED STATES DEPARTMENT OF THE INTERIOR

U.S. FISH AND WILDLIFE SERVICE

BUREAU OF COMMERCIAL FISHERIES

COMMERCIAL FISHERIES Review

VOL. 31, NO. 10

OCTOBER 1969

COVER: Tuna fishing in the Pacific.

COMMERCIAL FISHERIES
Review

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Throughout this book, the initials BCF stand for the Bureau of Commercial Fisheries.

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Foreword

Having served as Governor of Alaska, the Nation's leading State in value of fishery products landed, I have a special interest in the future of our fisheries.

While it is true that some segments of our commercial fisheries are at present economically distressed, there are other segments which are prospering. Actually, we have many fishing industries, because the factors which affect the salmon industry in the Pacific Northwest, for example, are entirely different from those affecting the menhaden industry along the Atlantic coast.

The Bureau of Commercial Fisheries is working with representatives of States, universities, and industry laying the groundwork for a Joint Master Plan for Commercial Fisheries. The purpose of the Joint Master Plan is to provide a mechanism for considering the views of all agencies and groups working on U.S. fishery problems and to identify areas in which increased efforts are required. We are fully aware that the plan is no panacea, but it can serve as a guide for a coordinated course of action in the future.

There is more at stake than simply our ability to supply our domestic markets. We must think of the vast quantities of underutilized species off our shores that could be harvested and used to supply the growing need for high quality protein throughout the world.

Our commercial fisheries need attention. They are a valuable natural resource which must be maintained and managed to provide the maximum sustainable yield. I believe we are moving in the right direction.

Walter J Hickel

Walter J. Hickel
Secretary of the Interior

U.S. AND POLAND SIGN MID-ATLANTIC FISHERIES AGREEMENT

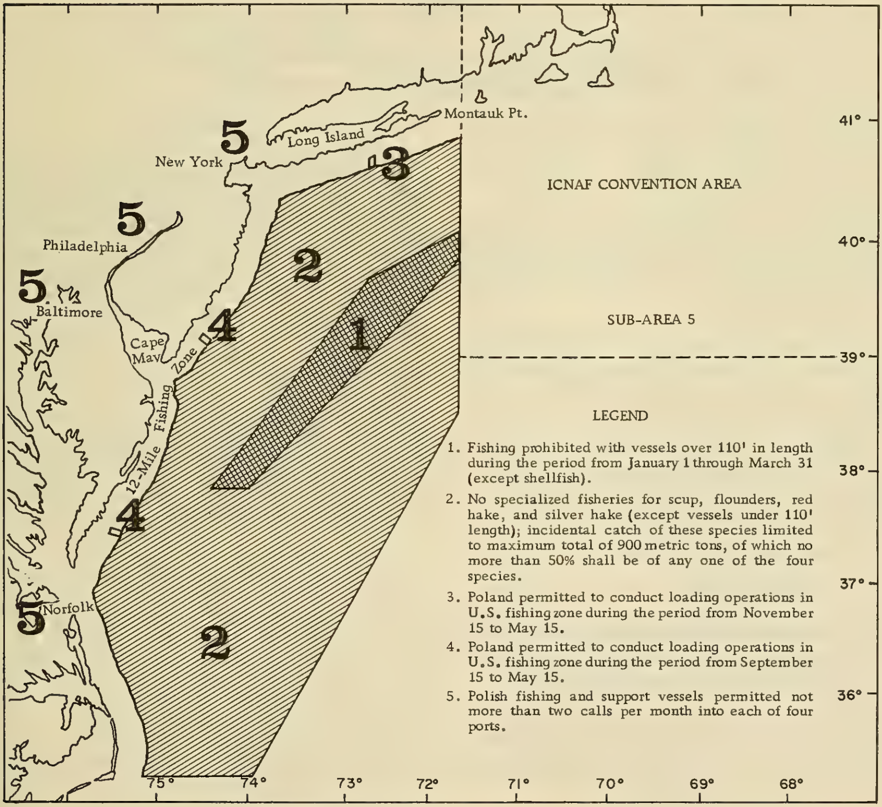
The U.S. and Poland have signed a one-year agreement on mid-Atlantic fisheries. It took effect June 12, 1969.

The agreement provides for cooperation in fishery research leading to a conservation program for species fished by either country off the U.S. mid-Atlantic coast. It also provides that Poland take special measures to protect species of special concern to U.S. fishermen--and that the U.S. facilitate entry of Polish fishing and supply ships into 4 U.S. ports.

Both countries will conduct joint research on fish of common concern, and exchange scientific and statistical information on the mid-Atlantic fisheries. And, to foster better understanding between Polish and U.S. fishermen, fishery representatives will be exchanged between the fleets on the fishing grounds.

Prohibitions

To conserve red hake, silver hake (whiting), scup, and fluke, Polish fishermen will refrain from fishing in a specific area where



those species concentrate during winter months. Polish fishermen who have been fishing primarily for herring and mackerel will not fish red hake, silver hake, scup, and fluke in the mid-Atlantic. In addition, they will take special precautions to avoid concentrations of groundfish during the entire year.

Loading Zones

In return, Polish fishermen will be allowed to unload and transfer their catches in 3 areas within the U.S. 9-mile contiguous fishing zone. One is off Long Island, adjacent to the Soviet loading zone; the second, off New Jersey, south of Atlantic City; and the third, off Virginia, north of Chesapeake Bay. The loading zones may be used only during winter and early spring. No Polish vessels will be allowed to fish in the contiguous zone.

Port Entry

Both governments agreed to allow a limited number of fish and supply ships into their ports. Use of port facilities at New York, Philadelphia, Norfolk, and Baltimore by a limited number of Polish fishing and supply vessels was made easier.

U.S. NAVY FLYING OCEANOGRAPHERS AID ICELAND'S HERRING INDUSTRY

A U.S. Navy plane has been searching for temperature data that would help Iceland predict the route herring might take in their annual migration from Norway to Iceland.

Iceland asked for help when she realized that herring, 90% of her export products, would be difficult for fishermen to locate again this season.

Herring's Migration

In their migration from Norwegian fiords to Iceland's east coast, the herring seek zooplankton, which survive and multiply only in certain favorable temperatures.

Until recently, the herring have run at the surface. This made visual tracking easy. But, in the past several years, temperature fluctuations have forced the herring to deeper layers of water in search of food. This created problems for the fishing fleet.

Other Nations Fishing

Besides the problem of tracking, other nations have been catching the young herring in their spawning regions before they reach the Icelandic fishermen. This leaves the older, larger, and more valuable--but much more elusive--fish to reach Iceland. Overfishing in spawning grounds and nonreplenishment of stock have reduced Iceland's available stock from an estimated 10 million tons in 1965 to 1.5 million tons in 1969.

Iceland Asks U.S. Assistance

Icelandic officials recognized that more than visual tracking was needed if the herring industry was to thrive. Last year, they requested aid from U.S. Naval Oceanographic Office airborne facilities working near Iceland to track the fish by sea-surface temperature surveys. The work was so successful that the airborne team was requested again this year.

The Area Covered

The team flew a general pattern over large areas off east and northeast shores of Iceland to get an idea of existing temperatures. As the plane flew low, sometimes as low as 200 feet, its airborne radiation thermometer recorded sea-surface temperatures.

After 2 days, the U.S. and Icelandic specialists had mapped the probable route that herring would follow from Spitzbergen, where the main stock was then located, to eastern Iceland, where their migration ends.

Oceanographer Jeff Kerling said: "The survey was economic both in time and money for the fishing fleet. With an idea of where the fish will be, the fishermen can go right to the predicted spots. In previous years, fishermen have had to go so far to locate the fish that their catches spoiled before they could get back to Iceland."

UNITED STATES

SHELLFISH SALES SLUGGISH

Consumer demand for shellfish has been sluggish for most of this year, report BCF economists. The shellfish industry is not experiencing the almost-annual increase in consumption that has prevailed throughout the 1960s.

Record high prices in summer 1969--10% or more above a year earlier--for fresh and frozen shrimp, northern lobsters, and lobster tails were taking their toll of shellfish sales. Sales through July were down roughly 10% from a year earlier. Only northern lobsters maintained last year's level.

Income Rise Boosts Sales

Shellfish consumption responds favorably to increases in income. Consumer income has risen this year, but the general rise in prices has wiped out most of the income gain. Any increase in "real" income has been meager. This has been true since mid-1968.

Eating At Home & Out

The effect of income is evident in expenditures for food eaten at home and away from home. Expenditures for food at home actually dropped from the first to the second quarter of 1969. Of even greater importance to the shellfish market are expenditures for food away from home. These rose slightly in the second quarter, but were only 2% above a year ago. In effect, restaurant sales have held steady for nearly a year even though prices have increased.

Stretch Income by Cutting Food Spending

When inflationary pressures tend to hold incomes steady, or force declines, one way that consumers can stretch their incomes in the short run is to reduce food expenditures. Although the volume of food purchased may remain the same, a shift to lower-priced foods tends to hold total food expenditures about steady during a period of rising prices. Another quick way to stretch income is to cut down on restaurant eating. This strongly affects the shellfish market, which is primarily an institutional market.

Predictions for Coming Months

Consumption of shellfish in late summer and fall 1969 was expected to be a little lower than in 1968. Shellfish prices likely would continue above a year earlier during this period but might drop below end-of-August levels.

Fresh and frozen shrimp consumption was expected to be a little less than in August-October 1968. Shrimp landings in the southern states likely would be considerably less and shrimp imports would hold steady with a year ago. Inventories would continue above a year earlier. Even with an expected slight decline in supplies in the coming months, some downward adjustment in shrimp prices might occur to prevent too much inventory accumulation.

Sea Scallops

Sea scallop consumption was expected to remain low during August-October. Shorter supplies were not expected to offset generally weaker demand. This means that scallop prices would continue below 1968 levels.

Northern Lobster

Northern lobster consumption held about steady with a year earlier during first-half 1969. No increase was expected during the rest of the year; a slight decline might be in prospect. Northern lobster prices in recent months ran higher than last year. Prices probably would continue higher through the autumn, although prices likely would dip seasonally as larger supplies entered the market.

After a relatively large increase last year, spiny lobster tail consumption likely would drift lower this year, unless prices weakened substantially. Consumption was running about 10% behind a year ago. Prices and inventories were record high. Some price weakness was expected in light of the end-of-August inventories--even though imports drop seasonally in the fall.

BCF Seattle Scientists Invent Mechanical Scallop Shucker

Except for calico scallops, sea scallops are shucked manually at sea. This is a tedious, time-consuming, and generally unpleasant job. Since 1968, when serious commercial scallop fishing began in Alaska, the BCF Technology Laboratory in Seattle, Wash., has been working on the development of a mechanical shucking device to free the fisherman of this task.

A mechanical shucker must do several things. First, it must open the scallop; it must then remove the meat from the viscera or the viscera from the meat. If the viscera are removed first, the meat must finally be removed from the shell. The act of removing the meat must not damage it. The entire process must be rapid and sanitary, and the equipment should be economical of space and low in cost.

Working Model Developed

Scientists at the Seattle laboratory have developed a working model of a scallop opener and a device that removes the viscera from the meat. The inventors have applied for a patent to be assigned to the Department of the Interior. Persons interested in examining the prototype components from the point of view of manufacturing commercial equipment are invited to contact the laboratory at 2725 Montlake Blvd. East, Seattle, Wash., 98102.

New England Shrimp Fishery Is Growing

There is a growing market for northern shrimp (Pandalus borealis) found in various concentrations in the Gulf of Maine. BCF's Gloucester (Mass.) Exploratory Fishing and Gear Research Base has assisted the industry in developing this resource and finding commercial levels of concentration. The most promising areas are near Stellwagen Bank, Jeffrey's Ledge, and Nauset, Cape Cod.

Up to 50 small and medium-sized boats will work out of Gloucester this year to supply the demand. A new plant is planned for the state-owned Gloucester Fish Pier to handle up to 200,000 pounds of shrimp per day. About 100 persons will be employed to work in the cooking and freezing plant, plus 12 to 15 office workers.

A Hopeful Sign

This is a welcome reversal of the downward trend of recent years in the New England fishing industry. The shrimp boom is seen locally as a hopeful sign. The shrimp are available year round. Most vessel trips are 2 days and one night. Fishermen in Maine have successfully developed a market for the product cooked aboard vessel.

Maine's fishermen were first to go after this species. The shrimp are gaining in marketplace popularity at home and abroad. Some Gloucester-landed shrimp are being packaged for export to Europe.

Local fishermen are hoping that this new resource, along with pollock, may prove an alternative to the dwindling haddock resource.

Small Tuna Seiners Allowed Larger Incidental Yellowfin Catch

BCF has announced an increase in the incidental catch of yellowfin tuna permitted for small purse-seine vessels. It became effective August 22.

Under an amendment to yellowfin tuna regulations, tuna vessels using purse seines--and having a capacity of 300 short tons or less--may now retain a 40% incidental catch of yellowfin until a total of 4,000 short tons is taken by such vessels. Previously, the incidental yellowfin catch by these vessels was restricted to 30%.

Tuna Commission Recommendation

BCF's director said the Inter-American Tropical Tuna Commission had recommended that, during the 1969 season, the small tuna vessels of each nation fishing the regulated area should be allowed 4,000 tons after the regular yellowfin season closed.

The 30% incidental catch rate originally set by the U.S. proved too low. So it was adjusted upward to permit affected U.S. vessels

to use fully the 4,000-ton allotment. When this amount is reached, the small purse seiners will revert to the 15% incidental catch rate under which the remainder of the fleet is operating.

Tuna Fleet Carrying Capacity Increases

As of Sept. 1969, the carrying capacity of the U.S. tuna fleet had increased by about 6,500 tons--to around 54,100 tons. This was reported by BCF's Pacific Southwest Region. The 1969 fleet was joined by the 'Pacific Tradewinds,' 'Conquest,' 'Neptune,' 'Kerri M.,' 'Cheryl Marie,' 'Vivian Ann,' 'Queen Mary,' 'Mermaid,' 'Lou Jean II,' and 'Gina Karen.'

One other vessel, 'Kathleen,' is scheduled to join the fleet before the end of 1969. This will bring the total capacity of the U.S. fleet to about 54,600 tons, an increase of over 11,000 tons, or 20%, in 2 years. The increase in tonnage during 1969 was considerably greater than in 1968. Then, 4,060 tons of capacity were added; this brought fleet's carrying capacity to 47,660 tons.

When vessels now in the planning stages are considered, it is estimated that the U.S. fleet could be increased by another 4,000 to 5,000 tons in 1970.

Atlantic Activity

By mid-August, 24 U.S. flag purse seiners were fishing in, or had departed for, the eastern Atlantic Ocean off west coast of Africa to fish for tuna. Last year, there were 8 U.S. flag vessels fishing there.

Fishing has been reported fair to good. In mid-August, catches were being transshipped by refrigerated carrier vessels to Puerto Rico and California primarily, although some shipments reportedly were being made to Europe.

Bluefin Tuna Transit Pacific

Transpacific bluefin tuna migration has been reported by H. B. Clemens, California Fish & Game, and G. A. Flittner, BCF. Eight bluefin tuna, tagged and released in the California fishery, migrated westward across the Pacific Ocean. They were recaptured several years later near Japan.

Tagged bluefin, released near Japan and recaptured the following year in the California fishery, have migrated eastward across the Pacific. Clemens and Flittner point out that the bluefin probably undertake a regular migration across the north Pacific. Japanese and U.S. fishermen most likely are harvesting the same bluefin resource.

Japanese Method Tried in Saury Fishing

A chartered 100-foot whale catcher, the 'Dennis Gayle,' was used Aug. 13-19 to determine the suitability of the Japanese 'Boke Ami' (stick-held dip net) method for catching saury off California. The operation was led by Dr. Frank Hester, BCF Fishery-Oceanography Center, La Jolla, Calif.

Fishing was done between Point Reyes and Monterey, 40 to 100 miles off California. To attract and hold fish, three 8-foot light standards were mounted on the port (fish-gathering) side about 10 feet apart. Each standard had three 500-watt incandescent lamps housed in aluminum reflector bases. Half the lamps were equipped with blue filters; the other half were bare. A single 14-foot standard bearing three 500-watt lamp was mounted on the starboard (fishing) side; the outboard lamp was equipped with a red filter. A 2-kw. spotlight mounted on the bridge scanned the water's surface.

The trial dip net was constructed of $\frac{11}{16}$-inch nylon webbing, about 40-ft. wide and 20-ft. deep. Polyvinyl chloride pipe provided buoyancy and support; the bottom was weighted with chains and lead.

The Operation

With the ship underway, all lights were turned on at dusk. The spotlight swept over

the surface to induce saury to jump. When saury were sighted, the main engine was stopped and the starboard lights turned off. When large concentrations gathered under the port lights, the Boke Ami was lowered into the water on the starboard side. The starboard lights were turned on and the port lights extinguished. After the fish had aggregated under the starboard lights, the 2 white lamps were turned off. This left only the red lamp, which caused the fish to rise to the surface. As the fish were being brought aboard, the port lights were turned on again to gather more fish. Saury concentrated quickly under the lights, their numbers increasing with time. Small saury tended to stay on the surface, while larger saury stayed 5 to 10 feet below. Because of rough seas, the Boke Ami was used only at 3 stations, although saury were caught at all stations with a dip net. About 1,000 pounds of saury was caught during the cruise.

Effective But Expensive

It appears that the Boke Ami method is an effective means of catching saury. However, its commercial application in California may not be feasible because a large crew is required.

Flowing Sea Water Gives Best Growth of Oyster Spat

An experiment by BCF's Milford (Conn.) lab on the growth of oyster spat in different environments showed that those in raw, flowing sea water grew much faster than sibling spat in recirculated sea water to which food was added daily.

There was no difference in growth of spat in recirculated sea water fed X or 2 X quantities of food daily.

The growth of spat in the raw, flowing sea water was improved still more when X or 2 X quantities of food were added daily. These spat grew 2-2½ times as fast as those in recirculated sea water with the same amount of food added.

Iced Pacific Hake Tested in Making Kamaboko (Fish Paste)

Tests to determine the kamaboko-making properties of Pacific hake showed that fish kept on ice 7 days makes a superior kamaboko to that made from fish held on ice for one day. The tests were conducted by BCF's Seattle, Wash., Technological Laboratory.

When stored as surimi (a pulverized fish product) for 6 months at 0° F., kamaboko made from 7-day-iced fish retained most of its desirable elasticity; kamaboko from 1-day-iced fish lacked certain essential factors.

Better Understanding Needed

The researchers report sharp differences among different species of fish in their ability to form elastic gels. In some species, stale fish made better-grade kamaboko than fresh fish. This argues strongly, the researchers say, for a need to understand better the chemical and physical properties of actomyosin in different species--and how these properties change during storage, handling, and processing.

Restrictions on Walking Catfish Proposed

A proposal to amend regulations to restrict importation, transportation, or acquisition of live fish or viable eggs of the family Clariidae, after Dec. 31, 1969, was published in the "Federal Register," Aug. 19, 1969, by the Director, Bureau of Sport Fisheries and Wildlife.

Investigations by Interior Department have determined that the walking catfish, *Clarias batrachus* of the family Clariidae, competes with native fish for food and space. Clarias are virtually drought-resistant because they can estivate (spend summer in a torpid state), hibernate, or migrate overland to find water. Present fish-management practices have failed to control the spread of Clarias in Florida's fresh waters.

U.S. Agency Increases Efforts Against Fish Kills

The Federal Water Pollution Control Administration (FWPCA) is setting up a new program to report and investigate intensively fish kills caused by water pollution, FWPCA Commissioner David D. Dominick has announced.

He said: "The present voluntary program of reporting fish kills is no longer adequate in our stepped-up overall campaign against water pollution. The old system didn't provide for immediate reporting of fish kill incidents and didn't require any counter action by the FWPCA."

Under the new plan, FWPCA will participate actively in investigating fish kills, determining causes, and in providing technical help to control or prevent such kills.

Coast Guard Surveys Fishing Vessels

The U.S. Coast Guard has announced that a study of safety problems in fishing vessels has been underway for months. The study is entering a phase involving a physical survey of a sampling of vessels in U.S. fisheries.

The Coast Guard's concern arose from statistics indicating a consistently lower safety record for fishing vessels than for most other types of U.S. commercial vessels.

Survey's Purpose

The physical survey planned will attempt to "price out" safety standards to determine what improvements could be made that would be beneficial to the industry from a safety and financial viewpoint. The effect on insurance rates will be included. The Coast Guard has contracted for BCF assistance.

The Coast Guard emphasizes that it does not have preconceived ideas of what would be best for fishing vessels. It is looking to the industry for help.

U.S. Contributes $\frac{1}{3}$ to $\frac{1}{2}$ of Industrial Pollutants Found in World Oceans

The U.S. alone contributes from $\frac{1}{3}$ to $\frac{1}{2}$ of all industrial pollutants found in ocean waters, a speaker recently told scientists and students at the Virginia Institute of Marine Science, Gloucester Point, Va. The speaker was Dr. Edward D. Goldberg, Professor of Chemical Oceanography at Scripps Institution of Oceanography. Despite contamination of ocean waters by all industrialized nations, however, he is optimistic that the oceans will not become seriously polluted if proper controls are established in time.

Petroleum the Problem

Handling and using petroleum products is the key problem, according to Dr. Goldberg. "Petroleum products not only form the major basis for power and transportation, but they also provide the raw material for the synthetic chemical industries. Ninety-five percent of all organic chemicals originate from petroleum."

Dr. Goldberg pointed out that the introduction of lead tetra-ethyl into fuels has increased enormously the amount of lead byproducts in the air and water. "Although the percentage of lead added to the world ocean is small, we do not know its fate or how it may affect life in these waters. Lead has increased about 20 times that of the natural level in ocean surface waters in the last four decades."

Mercury's Impact

Dr. Goldberg said the real problem in disposing pollutants is to prevent their return to man. He cited mercury as an example. It is used as a catalyst in industrial chemical processes, electrodes in the chemical industry, and in pesticides. Between 5,000 and 10,000 tons of mercury are lost each year by agricultural and industrial users as stack gases and other wastes; much of it finally reaches the oceans.

Mercury's impact on the oceans was felt by the Japanese a few years ago. People in a coastal town were afflicted with "Minamata Bay disease." At first, doctors thought it was a new disease. Persons became seriously ill, palsied, blind, and bald. Fifty died. Later, it was determined that these people had been poisoned by the ingestion of methyl mercury chloride, a waste product from

manufacture of plastics. This had been concentrated by fish and shellfish--and had returned to man. The local government soon regulated the use and disposal of mercury contaminants.

Excellent Salmon Run at Kodiak, Alaska

A late-developing salmon run at Kodiak, Alaska, turned a predicted modest prospect into a 'phenomenal' run of pink salmon, reports BCF Juneau.

By late August 1969, more than 13 million salmon had been caught, perhaps the best odd-year run ever. Over 600,000 cases were produced. An estimate of salmon value was 50 cents per fish. No one could remember so large a catch so late in August.

Million In 1 Day

On Monday, Aug. 13, Kodiak fishermen caught a record one million pounds of salmon; a week later, Aug. 31, they caught 529,000 salmon.

Commercial Quantities of Geoduck Clams Found in Puget Sound, Wash.

Surveys conducted by the Washington State Department of Fisheries show that commercial quantities of geoduck clams exist in Puget Sound. These clams will be harvested by divers with hand-operated hydraulic equipment.

BCF's Seattle Marketing Office has informed local firms of the clams' availability and suggested their use in the firms' minced clam and chowder operations. Samples have been sent to a Seattle seafood company for testing and evaluation.

The Geoduck

The geoduck, Panope generosa, lives deep in the unshifting sand and mud bottoms of sheltered bays from Alaska to Mexico. It is usually found on the mean low water line, or somewhat below. It is the largest clam found in these bays. Individuals more than 8 inches long and weighing more than 10 pounds are not uncommon.

The geoduck lives in a semipermanent burrow often 3 or 4 feet below the surface; it sends its long siphon (tubular organ) upward. Any disturbance in its neighborhood causes the geoduck to partially withdraw its siphon. Further disturbance causes further retraction. But, because the geoduck's shells are not large enough, its siphons cannot be withdrawn completely into the shell.

The geoduck is comparatively safe from all enemies--except man. Contrary to popular belief, it is an extremely poor digger.

Maine Seeks Improved Method of Holding Sardines at Sea

The Maine Sardine Council is conducting a major experiment to develop an improved method for holding purse-seined herring (sardines) at sea. The work is being done from Port Clyde, Maine, in cooperation with the local canning company. The Council has bought new types of equipment being used extensively in Norway.

The Experiment

Freshly caught fish are transferred alive from purse seine to floating boxlike nets. The nets then are towed 6 to 24 hours to keep the fish in good shape and improve their condition while awaiting transportation to the cannery. This also frees the purse-seine catching boat for more fishing. If the tests are successful, the process could be used by the entire sardine industry. It could result in better use of the available supply of fish along the coast.

Veteran Norwegian fisherman Captain Arne Gronningsaeter is supervising the operation. The canning company is furnishing boats and crews.

ECONOMICS OF HAWAII'S SKIPJACK FISHING INDUSTRY IS EXAMINED

A study by Yung Cheng Shang of the University of Hawaii suggests that the slow growth of Hawaii's skipjack fishing industry is not due to overfishing. He indicates that industry profits--by themselves or compared to other industries--have been too low to induce new investment. His study is titled: "The Skipjack Industry in Hawaii: Some Economic Aspects," published by the university's Economic Research Center.

Mr. Shang says that the new state loan programs and higher exvessel prices of the last few years "hold some promise for the future of the industry." If present tuna prices and industry costs continue, "some investment might be forthcoming." However, costs are likely to rise.

Increasing costs could be offset by greater catches. If the increase proves substantial, however, "it will affect the price of tuna." How great an effect would depend on the potential of the several markets for skipjack.

The fresh-fish market in Hawaii has only a limited potential. Because of high shipping costs, it is not feasible to ship to U.S. west coast canneries. Possible alternatives are: substitution of Hawaiian catches for the frozen-tuna imports that feed the local canneries--and export of canned tuna to U.S. markets. But even with present higher cannery prices, and the state loan program, "the investment in a fishing vessel is not even marginally profitable. This again points out the crucial role that the productivity increase will play in determining the future of the industry in Hawaii."

THE INDUSTRY

Hawaii's commercial fishing industry accounted for about $\frac{1}{4}$ of 1% of the state's gross product in 1955; in 1967, about 0.12%. This was "not due to an absolute decline in the value of commercial catch but to a very rapid growth of other sectors of the economy."

Skipjack tuna are the largest part of the commercial fish catch: in 1965-67, 75% of the weight and about 48% of the value of marine catch. During the past 20 years, the amount and value of annual skipjack catch "have remained relatively stable": about 10 million pounds and $1.3 million. Between 1948 and 1968, the number of boats and fishermen has declined steadily: from 25 to 16 boats and 260 to 162 fishermen. This indicates some increase in catch per boat and per man.

During 1948-1967, frozen tuna imports into Hawaii "increased significantly." In the U.S., per-capita consumption of canned tuna rose from 0.9 pound in 1948 to 2.4 pounds in 1967. Neither increased productivity nor favorable demand induced investments to replace worn-out and sunken vessels during the past 14 years.

Noting that past research studies of commercial fishing were concerned primarily with biological aspects, Mr. Shang states: "While the solution of certain biological problems is crucial to the industry, it is widely recognized that economic aspects play an increasingly important role."

Fishing Methods

There are 3 techniques of tuna fishing: longline, purse-seine, and pole-and-line. The longline is used for tunas that live hundreds of feet down: albacore, yellowfin, bigeye, and bluefin--and such tunalike species as marlin and swordfish.

The longline is composed of baskets of gear. Each basket has a mainline section supporting branch lines. Each branch line has one hook. The longline itself is supported at the surface by glass or metal floats. Longlining is used in tropical and temperate waters.

Tuna in surface and near-surface tropical waters--skipjack, small yellowfin, and small bigeye--are caught mainly by purse-seining and pole-and-line. Purse-seiners are highly mechanized and have power blocks, nylon seines, and better facilities to carry fish. They can catch thousands of pounds at one time. This technique is used in the eastern tropical Pacific and in Japanese waters.

In Hawaii, the fishing gear is a bamboo pole, a line, and a hook that is part of the lure. The poles are 7.5 to 15 feet long. The shorter one catches fish over 20 pounds; the longer one, smaller fish. Pole-and-line or live-bait fishing is done fairly close to the continental coast and oceanic islands. It is the major Japanese technique for skipjack and albacore fishing.

The Boats

Hawaiian skipjack boats, "which have evolved from the Japanese sampans," are built of wood, 59.3-80.5 feet long, and are 29 to 77 gross tons. Diesel engines range from 135 to 400 horsepower. Sonar and mechanical

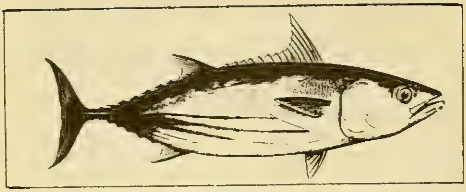


Fig. 1 - Skipjack (Katsuwonus pelamis).

Fig. 2 - This tiny silver fish--the nehu--feeds Hawaiian tuna industry. It is the bait.
(Warren R. Roll, Honolulu Star-Bulletin.)

Fig. 3 - Live-bait fishing for skipjack. Fish are breaking astern in vessel's wake. (H. Mann)

refrigeration are lacking. Each vessel has 6 baitwells, which also store fish. The crew is 6 to 12 men, depending on vessel size.

The Bait: Nehu

Live bait is used exclusively. It is predominantly the nehu, a small anchovy, 92-99% of all skipjack bait. The crew has to accumulate enough bait before scouting for skipjack. Nehu is found in estuarine areas, fairly uncommon in Hawaii. The nearness of certain baiting grounds is one reason why 12 of the 16 full-time skipjack vessels are based in Honolulu, Oahu.

The Operation

The vessels leave before dawn and, with daylight, begin to scout and fish. Bird flocks and water movements associated with the schools point to the schools. When a school is located, the vessels try to reach its head and the fishermen "chum" live bait to attract the fish close to the vessels. When fish follow a vessel's wake, they develop a "feeding frenzy" and attack anything that looks like bait. Standing shoulder to shoulder along the stern, each fisherman uses one pole to catch one fish as rapidly as he can. Only a small part of the school is caught. The vessels may run into several schools during the day. Darkness, or the absence of bait, ends scouting and fishing.

This operation has several problems; the bait problem probably is most serious. The fisherman spends about 30-40% of his time fishing for bait. This limits the number of trips. Also, the nehu is very delicate and about 30% die before the rest are used at sea. The nehu can live a few hours to a few days on the boats. It is one reason why fishermen work within 90 miles of coastline of the main islands. The need to replenish nehu also contributes to preventing trips to distant offshore grounds.

Search for Nehu Substitute

Attempts have been made to establish a source of bait fish that would be available without losing time. Marquesan sardine has been introduced into island waters, tilapia has been cultivated, and artificial bait tried (ineffective). BCF scientists have found threadfin shad comparable to nehu in luring tuna. It is hardy, stays alive for weeks, but it has not spawned in tanks. So there may not be enough to support a bait fishery.

Markets

Hawaii has 4 markets: a fresh-fish market, where fish are sold to consumer whole or filleted; a bait market for other fisheries; cured fish market, where fish is dried or smoked; and a cannery market.

BCF BEGINS MARICULTURE TRAINING PROGRAM FOR NORTHWEST INDIANS

Anthony J. Novotny

The Indians of the Pacific Northwest traditionally have lived near salt water, an important part of their rich heritage. At one time, the region's supply of marine products--halibut, salmon, crabs, and oysters--far exceeded the demand; the prosperity of the tribes was attributable directly to these resources. The art work of the Indians expresses the importance of these resources to the vigor of the tribal community.

The impact of non-Indian populations exploiting these same resources has been felt for about 200 years--most seriously in the past 50 to 75. Now, Indian and non-Indian alike use modern methods to harvest fish and shellfish, almost all destined for commercial sale. As demand frequently exceeds supply, it has become important to investigate every potential method for increasing the harvests of fishery products.

Lummi Indians

The Lummi Indian Reservation lies less than 15 miles from the Canadian border, in the northwest corner of Washington. Some 1,200 of about 1,600 members of the tribal community live there. About 90 percent of the Lummi families have incomes of less than $2,500 per year, mainly from salmon fishing on the reservation and on traditional fishing grounds nearby. In recent years, the total tribal income from salmon fishing has ranged from $100,000 to $200,000 per year. The income from other fishery resources has been much less.

The traditional dependence of the Lummi tribe on marine resources cannot be maintained without increasing the quantity of commercially important fish and shell fish. As the natural fishery resources outside the reservation are open to exploitation by Indian and non-Indian, one recourse is to increase the resources within the reservation. This can best be accomplished through mariculture (marine aquaculture).

Mariculture Has Merits

The reservation is a large tract of flat land bordering the Strait of Georgia. Many of its 7,600 acres are suitable for housing or commercial development; for the latter, the prime acreage is 5,000 acres of tidelands.

The Lummi Tribal Council is considering an imaginative project for developing the aquacultural potential of these tidelands. Primary emphasis will be on the culture of fish and shellfish of high economic value in a series of diked enclosures on the tidal flats.

BCF Provides Training

To support the Lummi tribe, the BCF Seattle (Wash.) Biological Laboratory is providing personnel and facilities to train Lummi youth. Guidelines are limited, and BCF scientists were given the responsibility for planning the training program.

We embarked on a program of maximum effort in practical training and experience, coupled with extensive assistance in continuing the formal education of locally accredited schools. Academic training would be given by BCF scientists whenever such training could be related directly to the trainees' possible future responsibilities. At every opportunity, they would participate in fishery research projects of BCF and the University of Washington to broaden their background and skills.

The Training Program

The experimental program began with four trainees. They were quartered on board the 115-foot BROWN BEAR, formerly an oceanographic research vessel, now converted into

Mr. Novotny is Fishery Biologist, BCF Biological Laboratory, 2725 Montlake Boulevard East, Seattle, Washington 98102.

a floating maricultural laboratory. The vessel is moored in fresh water near the University of Washington's Fisheries Center and within walking distance of BCF's Seattle Biological Laboratory.

The trainees were started immediately on practices of fish culture with eggs of fall chinook salmon. The adult salmon reach the Seattle Biological Laboratory via a short, interconnecting waterway that discharges into Puget Sound. The trainees spawned the fish and transferred the fertilized eggs to incubators on board the BROWN BEAR. The approximately one-quarter-million eggs taken enabled the trainees to arrange a variety of experimental conditions during the incubation period. These experiments were demonstrably effective in stressing the importance of environmental conditions to the health, vigor, and survival of the developing embryos.

Fig. 1 - Lummi trainees check their newly hatched chinook salmon eggs. Temperature-controlled supplies of fresh or salt water can be pumped into all the laboratories of the BROWN BEAR.

Standard salmon cultural practices were used (fig. 1). Since formal education completed by the trainees averaged 10 years, considerable effort was put into on-the-job academic training that would apply directly to maricultural problems. The trainees were taught the International (Metric) System and its application to laboratory instruments. They were instructed in the rudiments of statistics and statistical applications, the use and significance of elementary graphs for plotting data, manipulation of analytical balances, vernier and other calipers, and other measuring devices, desk calculators, and the slide rule.

The trainees were taught to use anesthetics and prophylactic compounds for handling and treating fish. This training required instruction in proportionality and its application to weight, volume dilutions, and to practical experience in preparing anesthetic solutions and salt baths.

Fig. 2 - Trainee measures dissolved oxygen in floating laboratory's water supply. The training emphasizes learning to measure--and to understand importance of--the properties of water that are vital to the mariculturist.

They were instructed in water chemistry. Emphasis was on characteristics of water quality important to mariculture, such as dissolved oxygen, pH, ammonia nitrogen, phosphates, nitrates, turbidity, salinity, and alkalinity. Thorough experience was given in using analytical instruments and "cook-book" techniques (fig. 2) for spotting trouble with the quality of the water used in maricultural systems.

The phases of training in fresh-water salmon culture are now almost complete, and the BROWN BEAR will soon be moved to salt water. There, the trainees will get experience

in the salt-water acclimation of rainbow trout and salmon--and the culture of these highly desirable fish in salt-water pens and cages.

Training in shellfish culture was begun in late fall 1968. The trainees collected bay mussels in Puget Sound, Wash., at regular intervals and processed the samples. They are being taught how to measure and weigh shellfish to interpret growth patterns, and what to look for in gonad development. They are also being taught to collect plankton samples, to determine when bivalve larvae appear, and how to prepare artificial cultch material for collecting spat. BCF scientists are preparing to begin training in the culture of algae for feeding bivalves and bivalve larvae.

When the BROWN BEAR is moved to salt water, the trainees will learn to condition commercially important bivalves for spawning, the care and feeding of larvae, and the collection of spat on artificial cultch.

Other Work Experiences

The Lummi trainees have benefited from work experiences other than those given on the BROWN BEAR. One trainee spent $2\frac{1}{2}$ weeks on the BCF research vessel MILLER FREEMAN off California assisting in the collection of plankton, learning how to operate large plankton nets, and to prepare plankton samples. More recently, two of the trainees have been working at the University of Washington with Professor Lauren Donaldson, a world-renowned authority on rainbow trout and salmon culture. Prof. Donaldson has been teaching them techniques for spawning trout, the care and incubation of trout eggs, preparing and handling eggs for shipment, "cold-branding" of salmon fingerlings, and good cultural practices.

When their training with Prof. Donaldson is completed, they will spend several days at the BCF Biometrics Institute, in Seattle, where they will be introduced to data processing. Although they will not be expected to acquire any specialized skills, they will be made aware of the labor-saving aspects of automatic data processing by working with IBM cards. They will start with simple card-sorting.

Some Problems But Progress Evident

Within 2 months after training began, it became evident that the trainees were not adequately prepared for the technical instruction. The scientists were not able to divert sufficient time from their regular duties to provide the guidance necessary to improve the trainees' comprehension. The number of trainees, therefore, was reduced to two. This reduced the training load for the scientists and increased personal contact, a factor that proved extremely important.

The Lummi Tribal Council reassigned one trainee to Peninsula Community College in Port Angeles, Wash., where he was enrolled in the Fisheries Technician program. The effectiveness of our training program was noted by one instructor there. He said that of five Lummi students enrolled, the one who had undergone 2 months' training with BCF was relatively advanced in technical competence and skills.

The cooperation of local school authorities in the training program has been outstanding. One trainee attends a local high school each morning, where he takes academic subjects required for graduation. The school authorities have arranged to give him elective credits for the work experience and academic instruction provided in the BCF training (called "Elements of Marine Science"). These credits will be applied toward his certification for graduation.

The training program is still highly experimental; it will be modified as the needs of the Lummi Aquaculture Project become evident. Plans are being made to include the training of Lummi women; it is expected that their involvement will encourage family participation and increase the stability of the project.

U.S. Fishery Jurisdiction

U.S. territorial waters are 3 miles--but fishery jurisdiction extends an additional 9 miles.

Fishery Statistics Program Is Set Up in Puerto Rico

The first commercial marine fisheries statistics program for Puerto Rico has been established. It was the work of the Division of Fish and Wildlife, Department of Agriculture, Commonwealth of Puerto Rico, assisted by the Institute of Marine and Atmospheric Sciences, University of Miami, Miami, Florida. Bureau of Commercial Fisheries Public Law 88-309 funds were used.

Development of the program began in July 1967 and reliable statistics were being obtained by August 1968. A fish ticket system similar to the one used in developing the Florida fisheries statistics program was recommended by the Institute and is presently in use. The data are processed by the Office of Agricultural Statistics of the Department of Agriculture.

Preliminary Estimates

Preliminary estimates place the minimum annual production near 3 million pounds, valued at nearly 800 thousand dollars to the fishermen. Landings are highest on the island's west coast (42% by weight, 35% by value) and lowest on the north coast (10% by weight, 14% by value). The east coast produces 23% by weight and 25% by value, and the south coast 25% by weight and 26% by value.

Finfish represent 87% of the landings by weight and 72% by value. Snappers, mackerels, and groupers are the most important commercial fish species. Lobsters (mostly spiny lobster, but including some sand lobsters) constitute 9% of the total landings by weight and 22% by value; these have the highest average exvessel price, $0.73 per pound, of all fish and shellfish landed in Puerto Rico. Land crab represents less than 1% of the landings by weight and value, but at $0.67 per pound, it is also a relatively high priced item. The overall average exvessel price for fish and shellfish is $0.28 per pound.

--Charles W. Caillouet Jr.
U. of Miami

Charter sloop sails tradewinds from St. Croix to Buck Island, Virgin Islands. (Photo: M.W. Williams)

House Streamlines Fishing Fleet Improvement Act

To speed renewal and modernization of the aging U.S. commercial fishing fleet, the House of Representatives has passed a bill amending the Fishing Fleet Improvement Act.

The bill, H.R. 4813, would simplify the granting of subsidies for new construction, and provide, for the first time, subsidies for reconstruction of existing vessels.

Amendments in H.R. 4813 would:

1) extend the construction assistance program until July 30, 1971;

2) provide subsidies of not more than 35% for vessel reconditioning, conversion, and rebuilding;

3) increase yearly appropriation authorization from $10 to $20 million;

4) base amount of subsidy, both for remodeling and new construction, on the difference between foreign and domestic costs for a class of similar vessels--instead of continuing to require a separate determination for each vessel;

5) eliminate several time-consuming procedures and administrative costs;

6) authorize study of ways to improve effectiveness of the U.S. fishing industry.

Need for Legislation

Urging passage, Rep. Pelly (Wash.) said:

"A modern fishing boat in a U.S. shipyard is a very substantial investment. For example, the cheapest boat constructed. . .since the 1964 amendment, cost over $230,000. Many of them were over $500,000, and several cost in the millions. For the average fishing boat operator, the construction of a vessel of this size and complexity is simply out of the question."

This bill provides subsidies for rebuilding and modernizing existing vessels, Rep. Pelly explained, "so that a vessel operator may improve the efficiency of his fleet without the staggering burden of constructing completely new ships."

Appropriation Increase Limited

It would take an estimated $30 million a year in Federal funds for 7 years to significantly modernize the U.S. fishing fleet. The authorization, however, has been limited to $20 million a year for 1970 and 1971. By 1971, Rep. Pelly believes, "we should be in a position to study the effect of the changes we are now considering. Hopefully, they will prove to have been an effective aid. . .and will justify a further commitment to complete the modernization of this. . .industry."

Simplified Procedures Were Needed

Rep. Pelly considers that previous legislation has been hindered by the "fact that the complicated hearing and administrative procedures of the Maritime Administration were adopted as the guidelines for the granting of subsidy applications." While these may be desirable in the construction of cargo liners costing $15 to $20 million each, he feels "they are an unnecessary burden and expense for small companies in the fishing business."

New Methods Eliminate Uncertainties

The Congressman added:

". . .due to the procedures for determining foreign shipbuilding costs many fishing-boat owners could not find out how much subsidy actually would be paid until after they had committed themselves. The amount of money they would have to raise to cover their share of the cost was always in doubt, pending certification by the Maritime Administration of the cost of building a comparable vessel in a foreign yard.

"No longer will the Maritime Administrator be required to determine the foreign costs of building each vessel for which subsidy is requested. Under this legislation, the Maritime Administrator will only be required to make periodic general surveys of the cost of building representative classes of vessels in foreign yards. These cost determinations will be a matter of public record so that applicants will be able to determine in advance how much assistance they can expect if their application is approved."

Minimum Construction Subsidies

Speaking for H.R. 4813, Rep. Feighan (Ohio) said: "It is anticipated that small

fishing craft operators should benefit substantially. . .from this bill, because of a new guarantee to receive a minimum subsidy of 35% for the construction of new fishing vessels. Heretofore, an applicant for a subsidy could never be certain of the amount he would receive until the 6 month's application period was completed."

Public Hearings No Longer Mandatory

The amendments end the requirement for a mandatory public hearing on each application.

"Every application approved since 1964 has involved a formal hearing before a hearing examiner" explained Rep. Dingell (Mich.). "Except for a few cases, most of the hearings have been quite pro forma, since there was no one to speak in opposition to the application. By providing everyone with an opportunity to request a hearing equal results would be obtained, with a smaller expenditure of time and money."

Trade-In Subsidies Discussed

Although he favored passage, Rep. Van Derlin (Calif.) voiced concern about the continued exclusion of vessel trade-ins from the program. He feels this omission may discriminate against those already in the fishing business who are trying to operate obsolescent boats. He believes they should receive more of the subsidy benefits already available to industry newcomers. The latter do not have to worry about unloading an aging boat to obtain a new one.

He noted that H.R. 4813 has tried to cope with this problem by authorizing a study that will include consideration of vessel trade-in subsidies.

Areas to be Studied

Discussing the proposed study, Rep. Keith (Mass.) said: "We have been trying to help the fishing fleet regain its proper position ever since I have been a Member of the Congress, and for many years before that.

"I think, perhaps, the most unique step in our current effort to solve this problem is in this legislation. . .a study under the leadership of the Secretary of the Interior, in consultation with the Maritime Administration, other interested Federal agencies, and professional and industrial organizations knowledgeable about U.S. commercial fishing vessels and their operation.

"The first area is that of insurance. It costs about $800 per man for insurance premiums alone for a fishing vessel to put to sea. In some nations. . .they do not have any insurance. In other nations--Canada, for example--they subsidize the cost of this insurance, and the net cost per man is around $200 per year."

Rep. Keith described 4 other areas to be studied: improvements and innovations in vessel and equipment design; trade-ins; improvement of safety and efficiency of existing vessels; and possibility of a construction reserve fund similar to that given the merchant fleet. There, owners are allowed to set aside reserves against vessel depreciation.

--Barbara Lundy

OCEANOGRAPHY

Microscopic Organisms May Help Clean Up Oil Spills

The use of microscopic organisms to help clean up oil spills is being studied by oceanographers of Florida State University. They plan to collect and study bacteria and other tiny organisms that oxidize and decompose small quantities of oil in polluted harbor waters and shorelines. They have observed that certain bacteria may speed the natural decomposition of oil that often fouls water and beaches.

At St. Marks, Fla., the eastern terminus of the Gulf's Intracoastal Waterway, bacteria have reduced or cleaned minor spills from oil barges and other craft.

Federal Grant

The scientists have received a $105,000 grant from the Federal Water Pollution Control Administration to collect from around the world microorganisms that keep minor oil spillages from fouling the water.

Dr. Carl Oppenheimer, director of Florida State's shore facility, said: "We know that this method by itself could not clear up a spill of say 100,000 barrels, but it could significantly speed up clearing the last portions, which sometimes linger on shorelines for years."

Mechanical methods could be used first to clear away most of the spilled oil. Then the organisms would finish the job.

So far, the oceanographers have observed organisms that attack the oil at the molecular level. They break the oil's hydrocarbon molecules into smaller and smaller units; eventually, they oxidize the oil into carbon dioxide.

U.S. and Florida Are Mapping State's Sea Boundaries

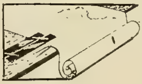
ESSA's Coast and Geodetic Survey (CGS) and the Florida Department of Natural Resources are working together to map the state's seaward boundaries. At stake is ownership of coastal and offshore lands which, at one time or other, are covered by the tide.

The problem involves a determination of federal, state, and private boundaries, ESSA states. In coastal areas, the mean high-water line generally marks the boundary between state and private property--whereas the mean low-water line is the base line, or starting point, for determining the limits between U.S. and state ownership. In Florida, state ownership starts at the mean high-water line and extends offshore 3 miles beyond the mean low-water line along the Atlantic coast--and 9 miles along the gulf coast.

5-Year Program

Costs of the 5-year program will be shared by the U.S. and Florida. Randolph Hodges, executive director, Florida Department of Natural Resources, hailed the program as "a major milestone in the history of our state. Valuable oil, gas and mineral reserves may well exist offshore. Frequently we learn of valuable recoveries of salvage materials from sunken vessels. These, together with the commercial and sport fisheries and marine nursery grounds, constitute a valuable asset."

Hodges said that although Congress has established the intended legal definition of Florida's boundaries along the Atlantic shores--and the Supreme Court for Gulf of Mexico waters--nevertheless controversy may continue until the state's seaward boundaries are determined.



States' Seaward Boundaries Not Accurately Determined

Rear Adm. Don A. Jones, director of ESSA's Coast and Geodetic Survey (CGS), said on Sept. 10 that the seaward boundaries between states have not been accurately determined. He noted the need to define these legal limits because of their increasing economic importance. He spoke at the annual meeting of the American Shore and Beach Preservation Association in Atlantic City, N.J.

Adm. Jones revealed that most states have not laid claim to as much ocean space as Congress has authorized. Although the national domain extends only 3 miles from shore, the Geneva Conventions (adopted in 1958 and ratified by U.S. in 1964) pushed U.S. economic boundaries (and thus the states') as far out to sea as land beneath it could be exploited economically.

New Significance

Adm. Jones declared: "The coastal zone is acquiring a new significance as the nation enters into a new phase of national interest in the sea. Accelerated development and growth of the use of the sea indicates the extent to which it will be exploited to the benefit of commerce, industry, recreation, and settlement."

"Some day," he predicted, "aquaculture may well rival and surpass agriculture in importance as the population growth imposes an increasing dependence upon the marine environment."

The ESSA official said an expanded national effort must be made "if our technology is to be used effectively in making intelligent use of our oceanic frontier. . .Among the basic problems now being encountered is the determination of the extent of offshore waters over which a maritime nation has sovereignty. Ownership of rights to the ocean floor, state-federal jurisdiction, the extent of fishing rights, and other factors are pressing problems."

The Admiral concluded: "Until recent years there seemed to be no need on the part of coastal states to claim ocean space." But rapid developments in the coastal zone and on submerged Continental Shelf now make it "increasingly imperative" that CGS accelerate its traditional shore-and-sea boundary program specifically for boundary purposes.

Alcoa Is Building Deep-Ocean Search & Recovery Vessel

Aluminum Company of America is building the "largest and most advanced deep-ocean search and recovery vessel ever designed." The work is being done by Peterson Builders of Sturgeon Bay, Wisc. The ship, the 'Alcoa Seaprobe,' will be operated by Ocean Search, Inc., a joint venture of Alcoa and Ocean Science and Engineering, Inc.

The 244-foot, all-aluminum craft will be capable of recovering 200-ton payloads from 6,000-foot depths. It is expected to be fitted out and ready for sea trials early in 1971.

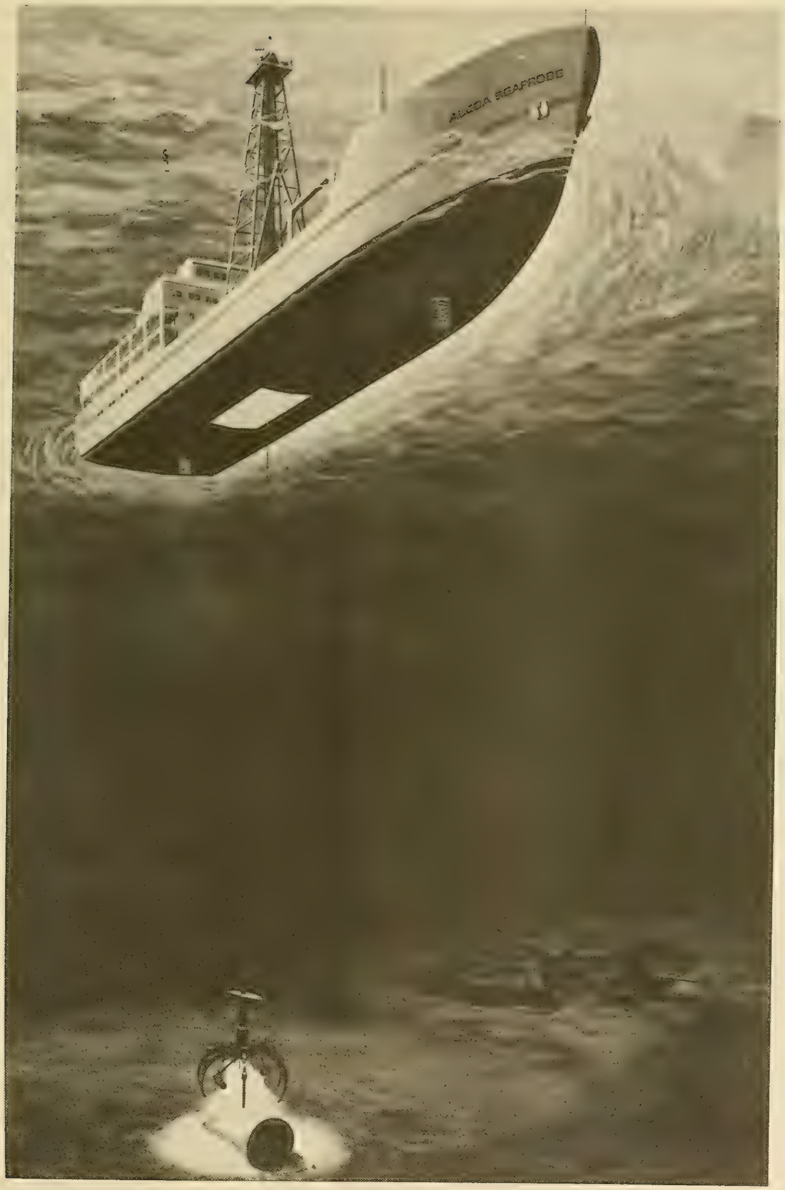
The Vessel

The vessel will have a 50-foot beam, 9-foot draft, and 2,000-ton displacement. Alcoa says: "It will possess the ability to hold its position in rough seas; search, core and sample mineral deposits on the sea floor; locate and retrieve heavy objects more than a mile beneath the surface; and to perform other research and exploratory oceanographic functions. No existing or proposed ship has anything approaching these capabilities."

The vessel's hull and superstructure will be of Alcoa-developed aluminum marine alloys. It will be powered by diesel electric generators giving it a 10,000-mile, 45-day cruising range. It will be equipped with "the most advanced communication navigation and search equipment available."

Its Missions

The kinds of missions the vessel will be given have not yet been determined. However, these are expected to include "deep-sea recovery work, deep-ocean archeological projects, and proprietary undersea geological explorations. . . ." The ship also will be available to assist in searching and recovering missing submarines or other objects.


ALCOA SEAPROBE

Scripps' Newest, the 'Melville,' Nearly Ready for Work

The newest U.S. oceanographic research vessel, the 245-foot, 2,075-ton Melville left Defoe Shipbuilding Co., Bay City, Mich., Sept. 2 for San Diego, Calif., and use by Scripps Institution of Oceanography. She was scheduled to arrive in late October.

The Melville paid a 2-day courtesy call on Woods Hole (Mass.) Oceanographic Institution (WHOI). A sister ship of the Melville, the 'Knorr,' is being built by Defoe for WHOI. She is scheduled for delivery later this year.

The Melville then proceeded to the Bahama Islands area for 2 weeks of intensive sea tests and trials.

Bahama Tests

The Bahama trials will provide extensive testing of the ship's machinery, especially winches and other deep-sea gear. Tested too will be her maneuverability with a new type of propulsion that enables her to move forward, backward, or sideways, or remain stationary over a fixed point in 35-knot winds and heavy seas.

This propulsion system uses vertically mounted, multibladed, cycloidal propellers, one at the bow and one at the stern. Although this system was U.S.-designed, its use is relatively new here. It has been used in Europe for more than 30 years.

The Melville

The Melville was built at an estimated cost of $7 million, including equipment. She has a maximum capacity of 62 scientists, technicians, and crew members. She and the Knorr were constructed under an $11.8 million, 2-ship, contract, excluding equipment.

'Franklin' Scientists 'Amazed' by Fish Abundance Off New Jersey

During the 30-day Gulf Stream Drift Mission of the 146-ton 'Ben Franklin' that ended in August, the crew saw relatively little marine life. But in September, during a 24-hour research dive 81 miles southeast of Atlantic City, New Jersey, scientists aboard the Franklin were "amazed" by the abundance of fish surrounding the submerged vehicle.

Also, the crew reported, findings 'hint' that a new seamount exists off the Jersey coast.

New Maps Show Subsea Mineral Areas

Four new maps showing the world distribution of known and potential subsea mineral resources have been published by the U.S. Geological Survey, Department of the Interior. The maps are supplemented by a 17-page pamphlet that describes subsea geologic features and reviews the magnitude and potential usefulness of seabed resources.

The maps were prepared at the request of the National Council on Marine Resources and Engineering Development. They are part of the U.S. government's effort to assemble basic information helpful to U.S. and foreign officials concerned with seabed exploration and development.

Dr. Vincent E. McKelvey and Dr. Frank F.H. Wang, authors of the maps and report, note that subsea petroleum (oil and gas), produced offshore by 25 countries, contributes 17% of world's output. It makes up nearly 90% of total value of current subsea mineral production.

The maps and pamphlet, "World Subsea Mineral Resources," are published as Miscellaneous Geologic Investigations Map I-632. They are available for $2.75 the set (maps not sold separately) from Distribution Branch, U.S. Geological Survey, 1200 South Eads Street, Arlington, Virginia, 22202; the Federal Center, Denver, Colorado; and Fairbanks, Alaska, 99701.

Foreign Fishing Off U.S. in July-August

OFF NEW ENGLAND & ON GEORGES BANK

Fog and haze restricted surveillance in July, but good weather in August permitted excellent coverage.

In July, about 175 vessels (150 in June); in August, 325 from 10 countries, perhaps the most in 1 month since summer 1963, when a far-less-modern, 300-400-vessel Soviet fleet fished off New England.

Soviet: Fleet in same general areas, June, July, and August. In August, 212 vessels--39 factory stern trawlers, 152 medium side trawlers, 8 factory base ships, 12 refrigerated transports and cargo vessels, and 1 tanker (118 in August 1968).

Polish: In June, 3 vessels; July, 18; August, 37--28 side and 4 stern trawlers, 4 carriers, and 1 factory base ship.

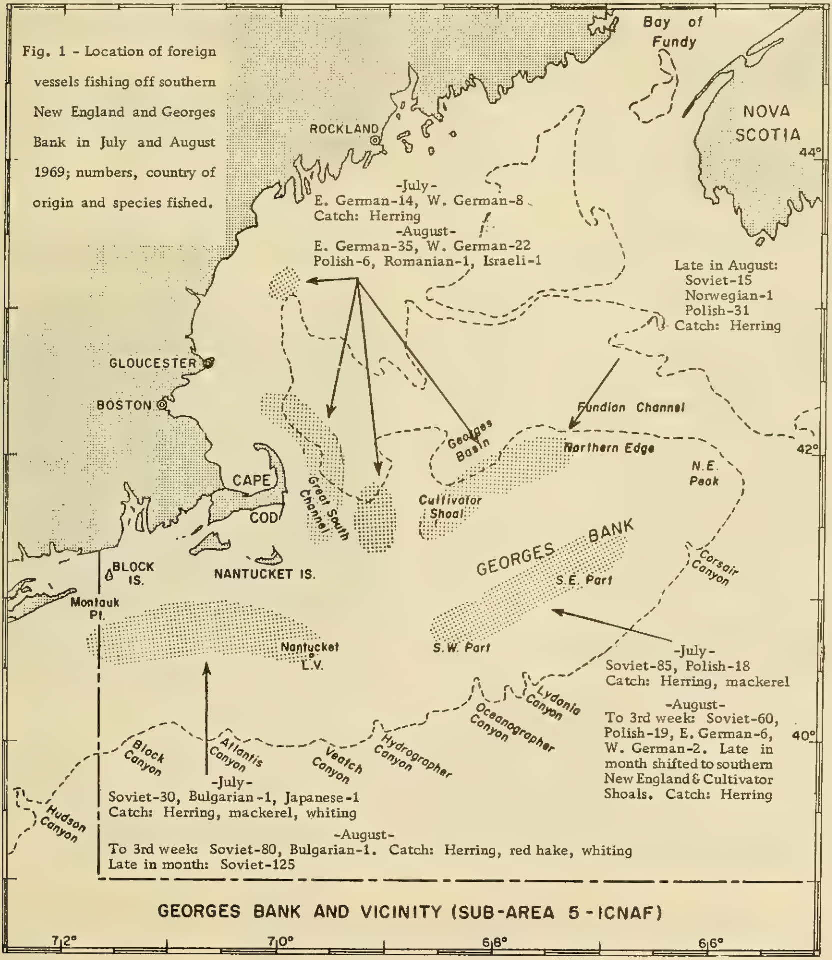


Fig. 1 - Location of foreign vessels fishing off southern New England and Georges Bank in July and August 1969; numbers, country of origin and species fished.

East German: In July, the base ship 'Junge Garde' and 14 vessels; in August, 40--27 factory and freezer stern trawlers, 11 side trawlers, and 2 factory base ships (31 in August 1968).

West German: In July, the fisheries enforcement vessel 'Frithjof' and over 10 trawlers; in August, 22 freezer stern trawlers and 2 fishery protection vessels. The latter provide medical aid, technical assistance, towing and salvage, and meteorological services. (About 29 in August 1968.)

Icelandic: Five herring purse seiners used Gloucester, Mass., as an operation base in July. A 6th joined them in August.

Norwegian: In August, 'Gadus' (stern trawler) was east of Cape Cod and Georges Bank, and 'Kloster' (herring purse seiner) explored herring fishery.

Bulgarian: A factory stern trawler sighted in early July and again in mid-August.

Israeli: 'Hiram' (factory stern trawler), 20 miles north of Race Point, Cape Cod, in July.

Spanish: 'Sobroso,' VI-5-8380 (side trawler about 165 feet long, 425 gross tons, 26 crewmen) entered Boston Harbor August 21.

Japanese: One stern trawler in July.

SOUTH ATLANTIC & GULF COASTS

No foreign vessels reported fishing in July or August.

WEST COAST

Soviet: One stern trawler off northern California in July. (One fishery research vessel in August 1968.)

Off Northwest coast, in July, 38 stern and 9 medium trawlers, 12 support vessels and 4 research vessels (54 vessels, including 37 stern trawlers, in July 1968). In August, 37 stern and 7 side trawlers, 9 support vessels, and 2 research vessels, mostly off northern Washington; some on LaPerous Banks off Vancouver Island. (In August 1968, 49, including 34 stern trawlers.)

July and August catches were almost entirely Pacific hake. A stern trawler off Vancouver Island and Cape Flattery caught almost 30,000 pounds in a single haul.

Japanese: In late July, 1 longliner off Washington; in August, 2 longliners and 1 stern trawler. One longliner caught about 5,000 pounds of ocean perch. Early in August, a longliner was taking black cod on almost every hook. (Two longliners in August 1968.)

ALASKAN COASTS

Japanese: In July, vessels decreased from 390 to about 185. About 190 remained throughout August (only a few more than in August 1968).

Early in June, 6 high-seas salmon fleets moved west toward Soviet coast. Just before fishery ended, about July 22, only 3 fleets were still in the area.

A North Pacific whaling fleet--about 12 whale killers, 1 factoryship, and 2 refrigerated carriers--was south of eastern Aleutians during July.

In July, the eastern Gulf ocean perch fishery increased from 12 stern trawlers and 1 refrigerated carrier to 20 trawlers and 2 stern trawlers. In August, 3 of the trawlers shifted to Albatross Bank in central Gulf. The ocean perch fishery along Aleutians increased from 2 stern trawlers in July to 6 trawlers and 1 refrigerated carrier in August.

As the Gulf ocean perch fishery increased, the groundfishery along Shelf edge in the Bering Sea decreased from 20 vessels to 12. In August, these 12 and a refrigerated carrier were south to northwest of Pribilofs.

Throughout July, 5 factoryship fleets trawled Alaska pollock and flatfish for minced-fishmeat, meal, and oil on Shelf east and north of Pribilofs. In August, 4 were northwest of Pribilofs; the fifth was north of Unimak Pass, in eastern Bering Sea.

In July and August, 2 factoryship fleets fished crab on Shelf, north of Alaska Peninsula. A separate fishery for tanner crab--1 combination processing and pot-fishing vessel and 3 smaller pot-fishing vessels--began northwest of Pribilofs in August.

Sablefishing longliners in eastern Gulf increased from 2 to 5 in July, and to 8 in August.

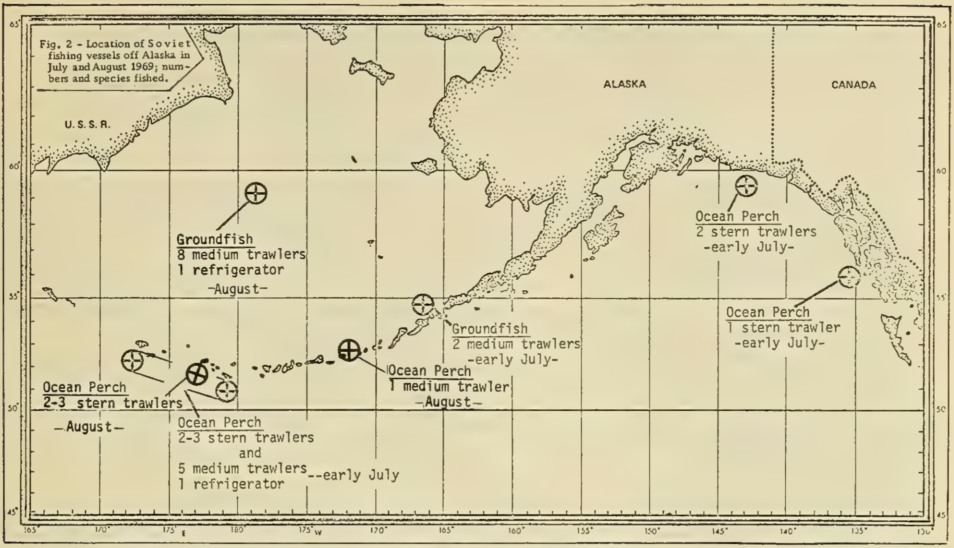



Fig. 3 - Korean stern trawler 'Keo Mun #501' fishing in the Bering Sea. Built in France in 1966, she is 106 feet long and 223 gross tons.

Republic of Korea (South Korea): One factoryship, 1 refrigerated carrier, and 7 trawlers fished Alaska pollock northeast of Pribilofs through July until late August, when they prepared to return home.

One independent stern trawler and 2 small stern trawlers also fished Alaska pollock in July, southwest of Pribilofs.

The 5 gillnetters that had fished salmon in late June were not seen after first week of July. Their refrigerated carrier sailed for home in late July and, presumably, the gillnetters accompanied her.

Soviet: Vessels decreased from 20 to about 12 in July and August, the fewest since Soviets began year-round fisheries off Alaska in 1963.

FEASIBILITY OF MONITORING WEST AFRICAN OCEANIC FRONT FROM SATELLITES

Paul M. Maughan, Merton C. Ingham, & J. Frank Hebard

For the past several years, the fisheries off the west coast of Africa have attracted worldwide attention because of the large catches in an area of contrasting warm and cold water masses near the Equator. The several cruises of the Congo-Brazzaville oceanographic vessel OMBANGO in this area have shown that schools of tuna generally follow the seasonal movement of the boundary, or oceanic front, between these water masses (LeGuen, et al., 1965). Further, the cruises have yielded sufficient information to hypothesize that the concentrations of yellowfin tuna should be greatest in waters of 24° to 25° C.

Berrit (1962) found evidence in sea-surface temperature and salinity data for the existence of the oceanic front (designated the Gabon-Angola Front), which appeared seasonally between 16° S. latitude and the Equator along the west coast of Africa (Fig. 1). This finding followed considerable research in the area east of approximately 5° W. longitude by Berrit (1959) and others.

Advances in the use of earth-orbiting satellites for earth resources observation led to the concept of using a satellite system to monitor the position of the Gabon-Angola Front. Previously, two satellite-mounted sensors, one operating in the infrared (IR) wavelength region and the other in the visible wavelength region, have delineated well-known oceanographic features. Wilkerson (1967) has shown that certain features related to the Gulf Stream are discernible from IR data relayed to earth from experimental NIMBUS satellites. He obtained TV-pictures that clearly outlined the western edge of the Gulf Stream and indicated the presence of warm Gulf Stream water moving alongside the colder shelf water.

More recently, a TV-picture in the visible wavelength region from the Application Technology Satellite II (ATS II) has shown a region of upwelling associated with the Peru Current and its westward extension, the Pacific South Equatorial Current. This region of high thermal contrast was discernible by relating the band of low surface clouds to the surface current pattern (LaViolette and Chabot, 1967).

The major objective of the present study, therefore, was to determine the feasibility of monitoring the Gabon-Angola Front--and thereby provide to commercial fishermen real-time information on the position of the Front and the probable location of tuna.

OBSERVATIONS

The field phase of the feasibility study was conducted during cruise 6802 of the R/V UNDAUNTED (BCF Miami) in west African waters from September 19 to November 22, 1968. An Automatic Picture Transmission system, capable of receiving and photographing images from both visible and IR sensors mounted on satellites, was used on the vessel to acquire satellite data. At the time of the study only the ESSA-6 weather satellite was operational and only in the visible mode (no IR sensor was carried aboard ESSA-6), so no IR data were acquired. Surface truth data, both oceanographic and meteorological, were obtained on the UNDAUNTED for association with the satellite data.

The satellite TV-picture receiving equipment on board the UNDAUNTED, which was activated for 37 orbits, yielded 123 photographs from the ESSA-6 weather satellite during the cruise. The number of photographs received during an orbital overpass depended on the length of time the satellite was above the horizon as "seen" by the receiving antenna on the vessel. Each picture transmission required 3.4 minutes plus a 2.4-minute synchronization period between transmissions;

Dr. Maughan is Special Assistant to Assistant Director for Marine Resources, Washington, D.C.
Dr. Ingham was Oceanographer, BCF Tropical Atlantic Biological Laboratory, Miami; now Director of Oceanography, U. S. Coast Guard Oceanographic Unit, Washington, D.C.
Dr. Hebard is Oceanographer, BCF Tropical Atlantic Biological Laboratory, Miami, Florida.

U.S. DEPARTMENT OF THE INTERIOR
Fish and Wildlife Service
Sep. No. 850

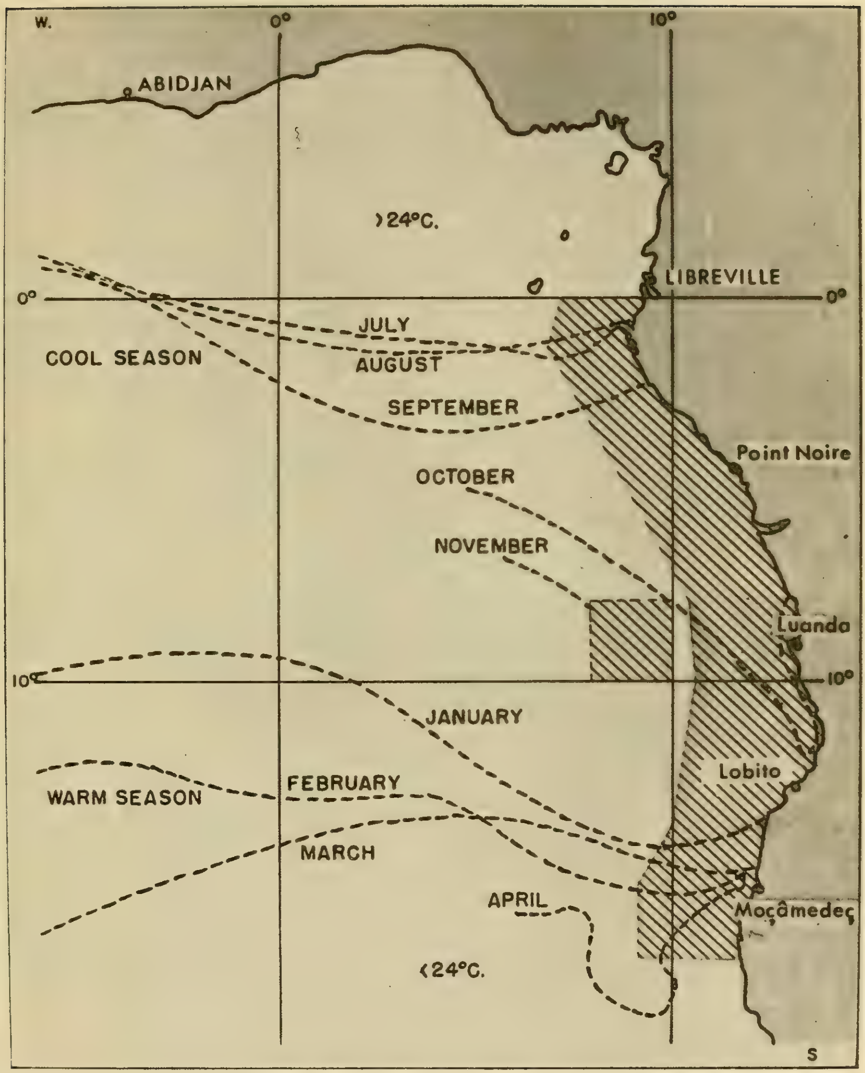


Fig. 1 - Seasonal movement of the Gabon-Angola Front associated with the 24° C. isotherm. Survey areas for R/V UNDAUNTED Cruise 6802 are hatched.

thus one picture was received for each 6 minutes the satellite was above the horizon, or a maximum of four pictures per orbit.

Areal coverage of the TV-pictures in an orbital pass was extensive. In some orbits passing nearly overhead, the area covered in four pictures was approximately 80° of latitude (from Sicily to a point south of Capetown) by 25° of longitude (at the Equator).

The quality of the photographs received was variable. The major problem that affected quality was the variation of signal strength between orbits. This fluctuation prohibited the establishment of a constant setting for the intensity and contrast controls on the receiver. Operator experience led to more frequent acceptable control settings, but the first picture of an orbit was often used to establish the proper setting. In pictures that included large areas of broken cumulus clouds, it was difficult to adjust the contrast to reveal both cloud detail and coastline. Interference lines appeared in the pictures as a result of the ship's roll (when it exceeded 15°) and as a result of radio transmissions from the vessel.

To supplement the shipboard TV-pictures, 276 ESSA-6 pictures of African coastal waters during September 15-December 1, 1968, were purchased from the Mulemba Astronomical Observatory, Luanda, Angola. The average quality of these photographs was better than that of the shipboard pictures, but they also suffered from the lack of contrast control necessary to reveal coastlines in areas of broken cumulus clouds.

In addition to the ESSA-6 TV-pictures, 15 ATS III pictures of the southeast Atlantic Ocean taken during late October and early November were obtained from the National Aeronautics and Space Administration (NASA). Because the ATS III satellite is in a geo-synchronous orbit at approximately 22,000 miles above the Equator, and was stationed just east of the South American continent, only large-scale features such as major cloud formations in the study area were observable in the pictures.

FEATURES OF THE SATELLITE PICTURES

The features revealed by the satellite TV-pictures can be separated into two groups--those directly visible, and those manifested by cloud patterns. The directly visible features include coastlines, lakes, mountains, and islands--all of interest in this study as geographical reference points. Their use in this capacity depended upon the absence of cloud cover, but some areas such as Lake Chad, the Nile River, the Red Sea, the Mediterranean Sea coast, and the coastline south of Cape Frio (18° S.) were generally cloud-free and provided dependable reference points.

One geographical reference point, Lake Etosha Pan, was visible only because of cloud cover associated with it. Lake Etosha Pan is a marsh area in the northern interior of South-West Africa, located at about 19° S. latitude 16° E. longitude. It was observed regularly in the satellite pictures by virtue of its cover of stratus clouds in an otherwise cloudless area (Fig. 2).

Storm systems were easily observed in the satellite TV-pictures. Such observations could be very useful as aids in predicting weather and sea state conditions. For example, a large cyclone was observed in the central South Atlantic (between about 35° and 50° S. latitude) in a picture received on November 12, while the vessel was working southward along the Angola coast. The picture allowed the anticipation of increased sea states which were encountered about 24 to 48 hours later.

The most significant feature detected in the cloud cover pictures was a large clear or thinly clouded area which appeared consistently off South-West Africa and South Africa (Fig. 3). This clear zone was of variable size and shape, but averaged about 250 miles wide and 1,200 miles long; it extended parallel to the coastline from Cape Frio to Capetown. The clear zone probably reflects an area of cool sea surface temperatures caused either by upwelling or advection by the Benguela Current. (Advection as a cause may have to be discounted, however. Field-party members of the Scripps Institution of Oceanography R/V ARGO, working in the area early in November 1968, indicated no evidence of a northward current as plotted from navigational offsets calculated by a satellite navigation system.) Data regarding the clear zone were not acquired by the UNDAUNTED because the vessel did not work that far south.

No cloud features were detected in the satellite pictures which could be associated

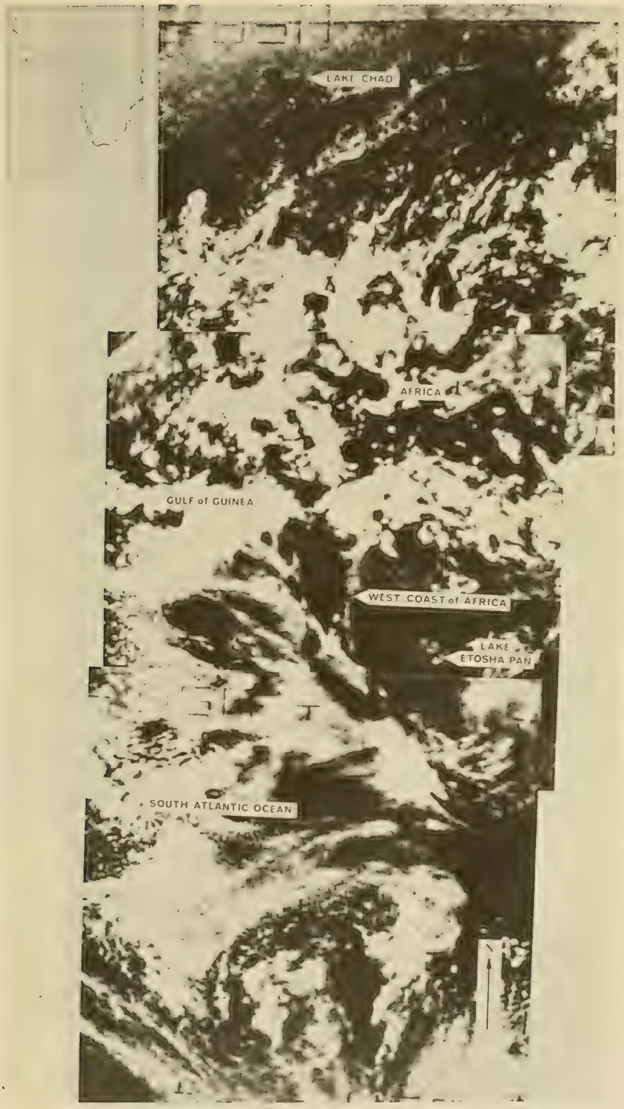


Fig. 2 - Mosaic of typical ESSA-6 weather satellite TV-pictures received during UNDAUNTED Cruise 6802 showing important geographical features. Dark swath on outline map shows surface area covered by mosaic.

Fig. 3 - ATS III TV-picture showing clear zone extending along the west African coastline from Cape Frio to Capetown.

with the position of the Gabon-Angola Front. The area of the Front was generally covered with broken cumulus clouds, but no pattern or discontinuity was discernible that could be related to the known position of the Front. During the cruise period, the Front was weakly developed and involved gradients that never actually constituted a frontal configuration. The strongest horizontal gradient of sea surface temperature for the 23° to 25° C. range (the range usually involved in the center of the frontal gradient) was 2° C. in 30 nautical miles. Sharper gradients were found around small nearshore patches of cool (less than 21° C.) upwelled water, but these had an apparent effect on cloud formation in only a few photographs--perhaps because of the small size of the upwelling areas.

CONCLUSIONS

This study has revealed that it is not feasible to monitor the position of the Gabon-Angola Front from satellite data during the September-December period, assuming that the oceanic and atmospheric conditions encountered on UNDAUNTED cruise 6802 were typical. Apparently the gradients involved in the Front during this period were too weak to produce an abrupt change in cloud cover.

A distinct pattern in the cloud cover was observed consistently off South-West Africa and South Africa, which is apparently related to cool sea surface temperatures from upwelling or advection of the Benguela Current. The large clear zone associated with the cloud pattern should provide a useful environment for air-sea interaction and satellite monitoring feasibility studies for the following reasons: (1) The presence of the clear zone is predictable. (2) Its boundaries are sharply delimited and probably reflect sharp sea surface temperature gradients. (3) It changes shape, mainly along the northern limit of the zone in a period of less than 24 hours. (4) Cumulus, stratus, and clear areas could be studied within a radius of about 50 miles in the vicinity of the northern boundary. (5) Frequently, a bifurcation appears in the northern boundary of the clear zone, probably reflecting advective patterns of surface waters. (6) The clear zone is associated with either a major upwelling area or a major surface current, or both.

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LITERATURE CITED

BERRIT, G. R.
1959. Résultats scientifiques des campagnes de la "Calypso" Fasc. IV. Océanographie physique - Ann. Inst. Ocean. T. 37-1959: 37-73.

1962. Contribution a la connaissance des variations saisonnieres dans la golfe de Guinée - Observations de surface le long des lignes de navigation, Deuxieme Partie, Étude Regionale, Cahiers Océanographiques 14 (9): 633-643.

LaVIOLETTE, P. E. and P. CHABOT
1967. A satellite photograph of Pacific Ocean currents. Deep-Sea Res. 14(4): 485-486.

LeGUEN, J. C., F. POINSARD, and J. P. TROADEC
1965. The yellowfin tuna fishery in the eastern tropical Atlantic (preliminary study). Com. Fish. Rev. 27 (8): 7-18. Also Sep. No. 739.

WILKERSON, J. C.
1967. The Gulf Stream from Space. Oceanus 13 (2 and 3): 2-8.

EXPERIMENTAL PRODUCTION OF FISH PROTEIN CONCENTRATE (FPC) FROM MEDITERRANEAN SARDINES

Norman L. Brown and Harry Miller Jr.

Early in 1967 the National Center for Fish Protein Concentrate (NCFPC) undertook to cooperate with the United Nations Industrial Development Organization (UNIDO)/FAO mission to the plant of the Société Nationale Farine Alimentaire Poisson (SONAFAP) at Agadir, Morocco. This plant had been set up some years before to manufacture FPC by solvent extraction of a press cake made by wet reduction of sardines. However, the plant had encountered production difficulties involving, among other problems, variability in the quality of the product. The quality was so low that its addition to foods was unacceptable. The objective of the FAO mission was to investigate the problems encountered by SONAFAP and to assist the plant in resuming production and distribution of FPC.

The first step was to determine whether a satisfactory FPC could be made from the available fish. NCFPC, at the request of UNIDO/FAO, prepared FPC from Mediterranean sardines shipped from Morocco, using the isopropyl alcohol (IPA) extraction process. This process had already produced stable products of reproducibly uniform quality with other fish. The Center's FPC program, having provided the technical information needed to obtain U.S. Food and Drug Administration approval of FPC as a food additive, had begun to broaden its investigations beyond the use of lean fish, such as red hake, to the much more abundant fatty fishes. Investigation of the use of Mediterranean sardines fitted well into the Bureau of Commercial Fisheries' program. The information developed in this investigation would assist the Moroccan project--and support Bureau efforts to broaden the base of raw materials permitted for FPC.

The use of other varieties of fatty fish will be the subject of a forthcoming publication.

NCFPC is continuing to cooperate with the UNIDO project by examining further samples of FPC produced in recent trials at the Agadir plant.

STUDY MATERIALS AND METHODS

Three shipments of Mediterranean sardines--one from Portugal, one from Yugoslavia, and one from Morocco--were received by NCFPC and processed into FPC. Although the species was not absolutely established when received, the point of origin of the fish identified reasonably well two shipments as Clupea pilchardus and one as Sardinia pilchardus. The fish, frozen immediately after capture, were flown to the laboratory at College Park, Maryland. Composition of the raw fish is given in Table 1.

Table 1 - Proximate Composition of Mediterranean Sardines (Percent by Weight)

Country of origin. . . . . Species	Portugal Sardine (Clupea pilchardus)	Yugoslavia Sardine (Clupea pilchardus)	Morocco Sardine (Sardinia pilchardus)
Date received	Dec. 1967	Dec. 1967	April 1968
Crude protein (N x 6.25)	16.7	16.8	19.1
Lipid	17.7	13.4	3.18
Ash	2.95	2.75	4.36
Volatiles (moisture). . .	63.7	68.6	73.3
Ca	0.68	0.61	0.35
P	0.57	0.51	0.28

Dr. Brown is Supv. Research Chemist
Mr. Miller is Chemist } National Center for Fish Protein Concentrate, BCF, College Park, Md. 20740.

Note: Fig. 1, Tables 3 and 4 are in the appendix in reprint (Sep. No. 851) of this article. For a free copy of the Separate, write to Division of Publications, U.S. Department of the Interior, Fish and Wildlife Service, BCF, 1801 N. Moore St., Arlington. Va. 22209.

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Processing Details

In 1967, the laboratory procedure for making FPC from lean fish was a modified "crosscurrent" batch extraction consisting of the following steps:

1. A batch of fish was comminuted (ground to a hamburger-like consistency) and mixed with azeotropic isopropyl alcohol (AIPA) at room temperature, with a ratio of solvent to fish of 2:1 by weight.

2. After 30 minutes of agitation, the solids and liquid (miscella) were separated in a 12-inch basket centrifuge.

3. The wet solids were then re-slurried with fresh AIPA and extracted continuously for 2 hours at ca. 155° F. (70° C.) in a system where the extract (miscella) was continuously drawn off, filtered, evaporated, and the condensed overheads pumped back into the extractor. (All the nonvolatile solubles--proteins, lipids, etc.--remained in the evaporator and the condensed overheads became somewhat richer in water than the AIPA.)

4. The solids were then separated from the miscella in the 12-inch basket centrifuge.

5. The solids were desolventized (dried) in a vacuum oven (pressure ca. 2 inches of mercury, i.e., 50 mm) at 160° F. (71° C.) for 18-22 hours.

Since the sardines were expected to contain much more lipid than the lean fishes for which this procedure had been developed, the procedure had been modified (for sardines from Yugoslavia and Portugal) to include one or two additional hot extractions to determine the effect, if any, on residual lipid content. In the process outlined above, this was done by repeating stages 3 and 4 once (Procedure A) or twice (Procedure B).

By the time the Moroccan sardines were received (April 1968), the laboratory had shifted its extraction procedure to a countercurrent system (Procedure C) so that processing information obtained would be directly applicable to larger-scale systems likely to be used for industrial production. Consequently, the sardines received from Morocco were processed in a manner closely approximating a commercial batch countercurrent process, using a 4-stage countercurrent procedure with an overall ratio of solvent to fish of 2:1. (This represents between one-third to one-fifth the total solvent used in Procedures A and B.) This procedure is outlined schematically in Figure 1 (in appendix). The first stage was performed at room temperature (with no added heat), the second, third, and fourth stages at about 155° F. (70° C.). The solid liquid slurry from each stage was separated, as in step 4 of the procedure outlined above. The final solids were desolventized as in step 5.

Theoretically, the processing of a large number of batches of fish would be required before this countercurrent system would attain steady-state operating conditions--that is, before the compositions of the miscellae and solids in each stage do not change from batch to batch. However, detailed analysis of the composition of the materials in each stage shows that, as a practical matter, the system essentially will have reached steady-state conditions after the fourth batch, and definitely after the fifth stage. Only the FPC produced by countercurrent extraction of Moroccan sardines (Sardinia pilchardus) was subjected to the complete processing procedure now used for FPC produced in this laboratory. Furthermore, because the fifth batch was most likely to represent steady-state conditions, fluorine analysis and nutritive evaluation were performed only on this batch of FPC.

Results

The results obtained with the three shipments of fish received are listed in Tables 2, 3, and 4. (Tables 3 and 4 are in appendix.) The proximate composition and amino acid pattern obtained for a sample of FPC made at Agadir in 1966 also are shown. In addition, average values are listed for proximate analyses, PERs, and a typical amino acid pattern for FPC made from hake by standard crosscurrent batch extraction process using AIPA. This process (Procedure "D") consists of a four-stage AIPA extraction using 2 parts of fresh IPA to one part of fish at each stage. Solid-liquid separation is accomplished in a 6-inch continuous solid bowl centrifuge and desolventization (drying) is performed in a 6-cubic-foot, double cone, tumbling vacuum dryer.

DISCUSSION

It is apparent from the data in the tables that no basic problem exists in processing sardines into FPC by the IPA extraction

Table 2 - Chemical Composition of FPC Produced from Mediterranean Sardines and Red Hake

Country of Origin / Species	PORTUGAL Sardine (*Clupea pilchardus*)		YUGOSLAVIA Sardine (*Clupea pilchardus*)		MOROCCO Sardine (*Sardinia pilchardus*)							U.S. Red Hake (*Urophycis chuss*)	
Sample (FPC)	Sp-1	Sp-2	Sy-1	Sy-2	Sm-1[a]	Sm-2[a]	Sm-3[a]	Sm-4[a]	Sm-5[a] (b)	Sm-5[a] (c)	SONAFAP FPC (Lot 39)	BCF FPC Typical Values	
Extraction procedure (h)	A	A	B	B	C	C	C	C	C	C	?	D	D
Date processed	1-3-68	1-4-68	1-9-68	1-10-68	7-23-68	7-24-68	7-25-68	7-26-68	7-29-68	7-29-68	8-9-68	(f)	(g)
Proximate composition (percent by weight)													
Crude protein (N x 6.25)	81.2	82.0	83.3	84.5	77.0	79.6	78.8	80.8	79.7	77.7	85.3	85.0	89.2
Lipid	0.70	0.90	0.56	0.23	0.5	0.15	0.24	0.23	0.22	-(e)	0.79	0.15	0.16
Ash	14.1	14.3	13.6	13.3	17.3	16.6	17.3	16.3	17.0	17.4	12.50	10.97	11.55
Volatiles (moisture)	4.8	3.8	3.6	3.7	7.0	4.8	5.5	4.6	4.4	8.2	4.0	4.50	0
Ca	3.5	3.8	3.9	3.8	4.9	4.7	4.8	4.5	4.8	-(d)	3.8	2.95	3.10
P	2.4	2.4	2.4	2.2	3.0	2.9	3.0	2.5	2.9	-(d)	2.3	1.79	1.88
F (ppm)	-(d)	-(d)	-(d)	-(d)	-(d)	-(d)	-(d)	-(d)	-(d)	70.2	-(d)	-(d)	-(d)
IPA (ppm)	-(d)	-(d)	-(d)	-(d)	120(e)	311(e)	124(e)	200(e)	-(e)	103	-(d)		

(a) These samples are the results of each batch of the five-batch countercurrent extraction.
(b) Before steam-stripping to reduce the residual IPA content.
(c) After steam-stripping to reduce the residual IPA content.
(d) This analysis not performed on this sample.
(e) This analysis was performed after the sample was steam-stripped. All other analyses on this sample were performed before steam-stripping.
(f) Average values for 10 samples, calculated on "as is" basis.
(g) Average values for 10 samples individually calculated on dry weight basis.
(h) See text for explanation of procedure.

process although considerable engineering modifications of the lean fish process may be needed. The only significant distinguishing factor among the three batches of sardines processed is the relatively high residual lipid content of the FPC made from the Portuguese and Yugoslav sardines. It was unfortunate, for the purposes of comparison, that these fish initially contained much more oil than the Moroccan sardines (perhaps a result of seasonal variation) and were not extracted in a countercurrent system as were the latter. However, previous work in this laboratory on the countercurrent extraction of fish with initial lipid contents as high as 20 percent has shown the residual lipid of the resultant FPC to range from 0.10 to 0.29 percent. This experience leaves little doubt that these sardines would have yielded an FPC with residual lipid contents of the same order if they had been extracted by the same procedure. The nutritive values of both SONAFAP FPC and Sample Sm-5 are comparable to FPC made from red hake, and all are at least equal to that of casein. The fluoride content of Sm-5 is well below the 100 ppm. now required by the U.S. Food and Drug Administration.

SUMMARY

NCFPC's investigation on production of fish protein concentrate (FPC) by isopropyl alcohol extraction of Mediterranean sardines indicates that the products meet all present U.S. Food and Drug Administration requirements on chemical composition and nutritive value. The products were made both by laboratory procedures involving combinations of cross-current and continuous batch extraction, and by countercurrent extraction procedures that approximate commercial production methods. It is particularly significant that, in agreement with results obtained for FPC made from other species of fatty fish in this laboratory, a satisfactory FPC can be produced from Mediterranean sardines by this prototype commercial process.

FISHERY OCEANOGRAPHY--III

Ocean Temperature and Distribution of Pacific Salmon

Felix Favorite

The research on the distribution and migration of the European eel, Anguilla anguilla, in the North Atlantic Ocean in the early part of this century became a classic study of fish and the ocean environment, many aspects of which remain unsolved today. The movement of this species during its life cycle is practically opposite that of the Pacific salmon, genus Oncorhynchus. Adult male and female eels migrate down rivers of western Europe and northern Africa into the ocean, where they spawn in the deep layers of the Sargasso Sea (in the southwestern North Atlantic Ocean, several thousand kilometers from the streams) and then die. The eggs hatch into larvae, which are passively transported for 2 years by ocean currents toward the European coast. Here the transparent larvae metamorphose into small, black eels that swim up the fresh-water streams to grow and mature into adults; the cycle is than repeated.

The Pacific salmon enter fresh-water streams along the coast of the northern North Pacific Ocean as adults; they spawn and die in the shallow streams. When the eggs hatch, the young salmon move downstream into the ocean, where some stocks are known to migrate long distances, yet return to their natal streams to repeat the cycle. The contrast between the salmon and the eel is rather amazing, and the opportunity to study the relations between the ocean environment and the Pacific salmon has presented a stimulating challenge.

The Pacific Salmon

Less than 30 years ago, the movements of Pacific salmon during the marine phase of their life cycle were relatively unknown. Less than 20 years ago, it was believed that pink salmon, O. gorbuscha, off the coast of southeastern Alaska rose from deep water to begin a shoreward migration; no evidence was found that they had come from the open sea when first noticed in coastal waters. At that time, the Japanese believed that the marine phase of their life cycle was spent in an unknown area of the North Pacific Ocean.

Even though no oceanic fishing for salmon was conducted, early estimates of an acceptable ocean environment were: depth, 0 to 200 m.; salinity, 30 to 35 ‰; and temperature, 0 to 20° C. The temperature range was probably based on summer stream and coastal temperatures, although evidence existed that adult salmon had migrated through streams where temperatures reached 27° C. Nevertheless, if no other factors were involved, a tolerance to surface temperatures of 20° C. would permit salmon to migrate as far south as lat. 30° N. across the entire ocean.

Studies of salmon on the high seas by the BCF Seattle Biological Laboratory began in 1955. Those were exciting times. Not since the studies of Charles H. Gilbert and his associates, conducted half a century ago off Alaska, was so much being discovered about the ocean distribution of Pacific salmon. Each day, during each set, the capture of additional salmon appeared critical, and little time could be spared for environmental research that competed with the fishing program. Nonetheless, some environmental observations were made aboard the charter fishing vessels.

Environmental Observations

For reasons to be explained fully later in this series, observations of temperature and salinity were made to depths of 1,000 m. at fishing stations to provide some indication of current patterns in this relatively little-known region of the North Pacific Ocean. These observations, made at night after the gill nets were set, posed little hindrance to the fishing program except for 1 or 2 hours of extra work for one or more of the crew. Only after several years of field work did we have instruments to make observations while

Dr. Favorite is an Oceanographer with BCF Biological Laboratory, 2725 Montlake Blvd. East Seattle, Washington 98102.

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the relatively slow (8- to 10-knot) vessels were en route to the next fishing location along predetermined cruise tracks.

We have observed that salmon are not found at 1,000 m. Why then did we require data at such depths, and were they really necessary? The lack of interest in environmental observations at depth during these early investigations had some basis in fact. It was known from the fishing efforts of the Japanese, as well as our own, that most salmon were caught in the upper half of a usually shallow 6-m. (20') gill net at night. This knowledge reinforced the belief that salmon basically were a surface fish, and that their distribution depended more or less upon surface conditions.

In fact, one early hypothesis concerning ocean distribution of salmon was that the extremely low surface temperatures--less than 0° C. in western North Pacific Ocean and northern Bering Sea during winter (due to ice formation in coastal areas and its subsequent advection eastward)--probably caused southward and eastward movement of salmon. This hypothesis implied that during winter the entire oceanic salmon population would be south and east of the Aleutian Islands, probably concentrated in the Gulf of Alaska. Winter fishing in the early 1960's, by BCF Seattle Biological Laboratory, however, showed that salmon were present as far west as long. 170° E., and even in the north-central Bering Sea.

An explanation is possible concerning the position of salmon caught in gill nets that neither has been proved nor disproved: When salmon close to the surface approach the net, it is detected sonically. A natural avoidance reaction would be for the fish to swim upward toward the surface and, unless they jump out of the water (which is unlikely), they are caught in the upper portion of the net. If they swim downward, no air-water interface restricts their movements, and they are able to pass under the nets. (In studies with sunken gillnets, some salmon have been caught at depths in excess of 30 m., or about 100 ft.)

Surface Temperature & Salmon Distribution

Evidence obtained during late spring and summer in the mid-1950's indicated that surface temperatures were not as directly related to salmon distribution as subsurface temperatures. The southern limit of salmon in the central North Pacific Ocean (as determined by gill-net catches) was at about lat. 47° N. A sharp faunal division seemed to occur here; south of this latitude, only albacore (Thunnus alalunga) were caught (salmon and albacore were taken in same net at only one of hundreds of fishing locations). The surface temperature at this latitude during the fishing period was about 11° C.; we tended to consider this temperature as an upper threshold for salmon in the ocean. Salmon, however, were caught in water temperatures of 12° to 13° C.--at some locations temperatures were much lower than the earlier estimate of 20° C. If surface temperatures of 13° C. are not limiting, salmon should be found south of lat. 40° N. in midocean, but they have not been taken there. Although it is possible that the southern limit of salmon is dictated by the northward limit of the carnivorous albacore, this relationship has not been proved.

The investigations suggested, as long ago as 1956, that temperature distributions at depth were closely related to the distribution of salmon. The subject still has not been studied. Cold winter air at these latitudes cools the sea surface and causes the water to be more dense than that below; because of this change in density, some masses of water sink and others well up until the upper part of the water column has a uniform temperature, representative of minimum air temperatures.

Subsequent insolation (exposure to sun's rays) during spring and early summer warms the surface layer. As warm water is less dense than cold, no sinking occurs other than that due to turbulent mixing. A lens of warm water forms at the surface. Before diffusion can distribute this heat to sufficient depths and eradicate the lower temperatures formed during winter, fall cooling begins. Thus a temperature-minimum stratum is formed (temperatures below the depth of winter mixing are higher than those causing the winter turnover); this structure is a relatively permanent feature of the northern North Pacific Ocean.

Temperature-Minimum Stratum

Several important points are illustrated by the gill-net catches and temperatures along long. 155° W. during summer 1956 (fig. 1). It is obvious that the two largest catches (94 and 150 salmon) were made at the more northerly

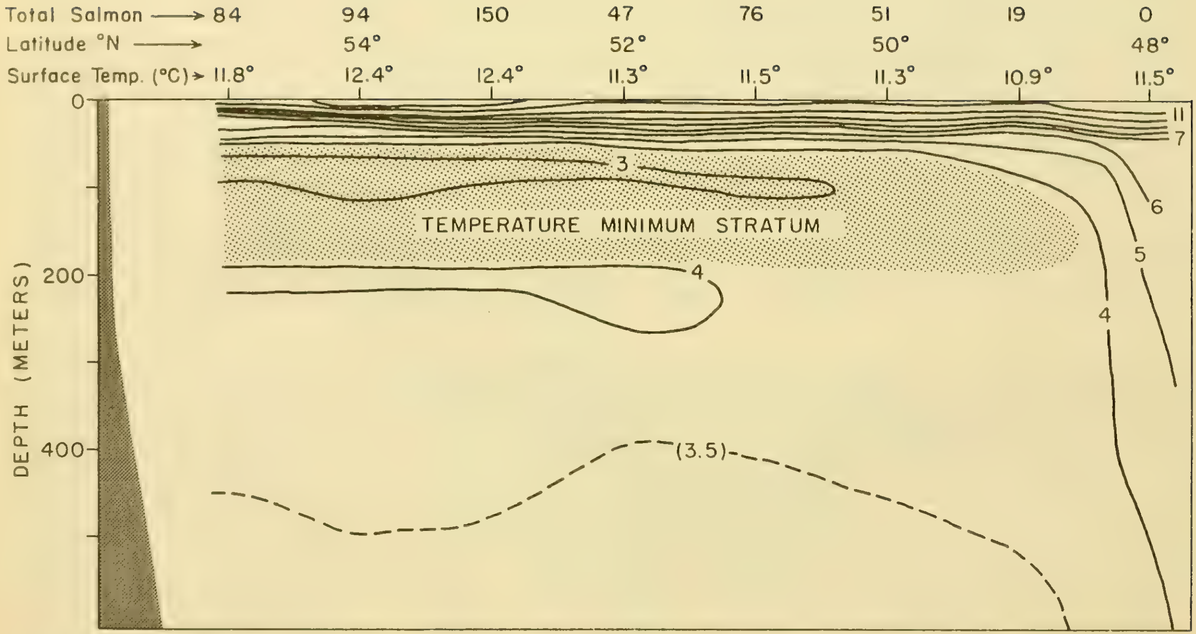


Fig. 1 - Vertical temperature distribution and surface gill-net catches along long. 155° W., summer 1956. Temperature minimum stratum shown by shading.

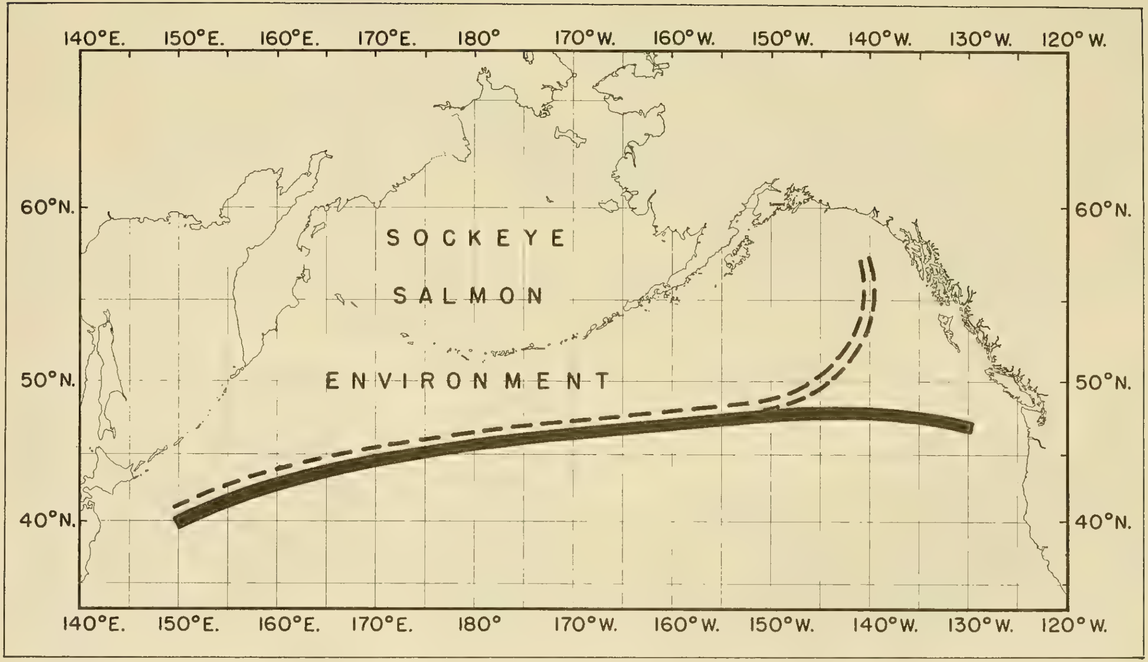


Fig. 2 - Approximate positions of southern boundary of temperature-minimum stratum of 4.0° C. (shown by dashed bar), and the southern boundary of sockeye salmon distribution as determined by gill-net catches (shown by solid bar).

stations and in water of maximum surface temperature--12.4° C.; also, that the southern limit of salmon catch (lat. 49° N. at this longitude) coincided with a subsurface (below 50 m.) temperature front which marks the southern limit of the temperature-minimum stratum. Data obtained subsequently have shown this feature to be permanent for the region and to extend across the ocean. The southern limit of the temperature minimum stratum has withstood the test of time as an indicator of the southern limit of salmon distribution in the central part of the ocean in summer; it also indicates the southern limit of sockeye salmon, O. nerka, year round in the central part of the ocean (fig. 2).

In the eastern part of the ocean, the southern boundaries of the temperature-minimum stratum and the limit of sockeye salmon distribution diverge; the southern limit of the temperature-minimum stratum (as defined) turns northward into the Gulf of Alaska, whereas the southern limit of sockeye salmon distribution continues eastward toward the Oregon coast. Skeptics may point to this divergence as evidence that the relation between temperature front and salmon does not hold. In many instances, when a scientist measures only one variable that has a direct effect on natural phenomena, the skeptics are right. In the present situation, however, the significance of the subsurface temperature boundary in this area is supported by other data.

The environment north of the subsurface temperature boundary appears to be preferable for adult sockeye salmon in the Gulf of Alaska, where they are found in winter and early spring before their shoreward migration to spawn. Figure 3 shows the distribution of sockeye salmon (from longline catches) in this area in spring 1962.[1] The large concentration in the central Gulf is in the general area of the temperature-minimum stratum (fig. 4). Particularly significant is the

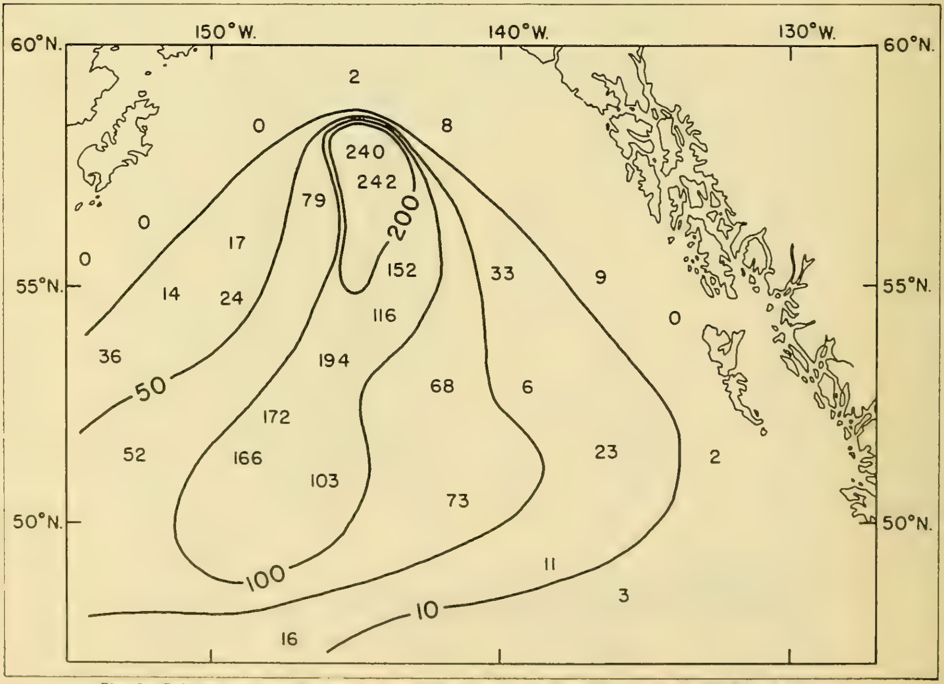


Fig. 3 - Relative numbers of sockeye salmon in longline catches (per 1,000 hooks), April 9-May 6, 1962.

1/Fisheries Research Board of Canada. 1964. Progress in 1962 in Canadian research on problems raised by the Protcol. Int. N. Pac. Fish. Comm., Annu. Rep. 1962: 30-53.

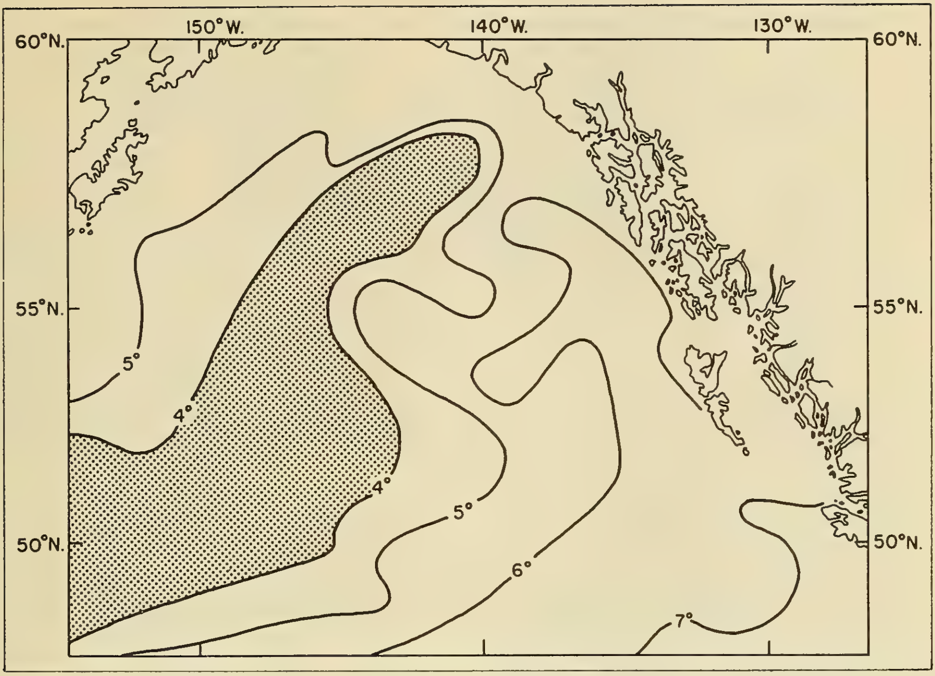


Fig. 4 - Temperature distribution at 150 m. showing extent of subsurface temperature-minimum stratum (shaded), spring 1962.

absence, or near absence, of sockeye salmon in coastal areas because they must cross these waters eventually to reach natal streams. Also interesting, though not shown, was the fact that only a few pink salmon were taken in the central Gulf area; the largest catches of pink salmon were taken between the diverging boundaries shown in figure 2 of the major concentration of sockeye salmon.

The subsurface temperature distribution indicates some of our 1965 sampling inadequacies (fig. 1). At that point in our investigations, fishing was conducted at 110-km. (60-mile) intervals, usually at each whole degree of latitude along various longitudes in the Subarctic Region; and, because of the possibility that the long string of gill nets might drift ashore during the night, no fishing was done close to land. Later, however, when oceanographic observations were obtained en route to fishing stations, it was revealed that the inshore areas along the Alaska Peninsula and Aleutian Islands were among the most interesting and significant from an environmental standpoint.

Effects of Warm Water

Warm water (4° C.) flows westward out of the Gulf of Alaska at depth along the south side of the Alaska Peninsula and Aleutian Islands; it forms a northern boundary to the temperature-minimum stratum in the Gulf. Thus, it is isolated as an offshore feature bounded on the south by an eastward-flowing Subarctic Current and, on the north, by a westward-flowing Alaskan Stream, along the south side of the Aleutian Islands.

The warm water at depth immediately south of the Alaska Peninsula is a permanent feature of this area. It probably has a significant effect on Pacific halibut (Hippoglossus stenolepis) stocks because it occurs at the approximate depth of the edge of the Continental

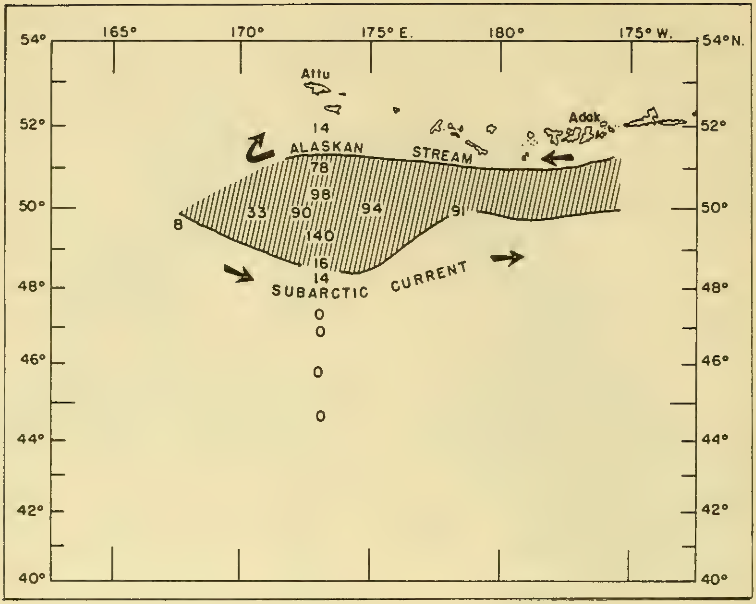


Fig. 5 - Location of subsurface temperature-minimum stratum (shaded) and numbers of sockeye salmon caught in gill-net sets, October and November 1965.

Shelf; also, it provides a uniform temperature of 4 to 5° C. during the year at 100 m., where surface temperature may vary from 2 to 12° C., and inshore bottom temperatures may vary almost as much as surface temperatures.

The location of the temperature-minimum stratum also appears to influence the distribution of maturing sockeye salmon south of the Aleutian Islands in fall. Data obtained in October and November 1965 show that large numbers were caught in surface gill nets in the general area of this stratum (fig. 5).

I have been careful not to imply a cause-and-effect relationship. Although the subsurface temperature distribution is a guide to determining salmon distribution (particularly of sockeye), it may not be temperature alone that is the controlling factor. It is obvious that ocean currents are involved; these currents will be discussed in a later article. The fact that the temperature-minimum stratum occurs at such a shallow depth is because the subsurface salinity distribution effectively prevents the cold surface waters from sinking any further. Both temperature and salinity determine density, which in turn governs flow. Furthermore, this plateau-like feature has cold water (approximately 3.0° C.) normally found only below 600 m. south of about lat. 48° N. in eastern part of ocean. It exists year round at depths usually less than 100 m. and has interesting biological and chemical aspects that have received only limited attention. Much research remains to be done.

In a harsh economic sea, commercial fishermen--aging, hardy, fatalistic--struggle to survive.

FISHING FOR A LIVING OFF NEW JERSEY

Nicholas Kazan

Everyone knows what the oldest profession is. Fishing. It is older than man. Or woman.

Figure it this way. Man evolved from lower orders: One day a monkey spoke, another understood, and man was created. But before monkeys existed, before dinosaurs and pterodactyls, before the first venturesome creature crept onto land, everything that lived lived in the ocean. And most things that lived there made their living by opening their mouths and going fishing.

It's not so easy for man. Before he can taste fish, an anachronistic process must bring it to him. Fishermen today use radios and charts, depth meters and fish scopes, but the basic elements of their art remain: a sea, a man, a boat, a net (or a hook, or a harpoon) and, somewhere, a fish. These are the rules, and they have not changed for thousands of years.

Men who live and work by these rules are scattered on a 50-mile radius from Philadelphia--in inlets, bays, and harbors along the southern New Jersey coast. Half a mile from the beaches and the Ferris wheels and the Spin-Inn Drive-In Hamburger joints are secreted half a dozen dock areas that send fresh fish to Philadelphia, Baltimore and New York.

Some docks are old and healthy, others old and dying, but the state of the industry is best described by the scene at one of them: Oteen's Harbor in Wildwood.

There, behind the 30-odd boats that were built to trawl for fish and now dredge for clams because that's what's left, behind the dock that has rotted under foot and collapsed overhead, looms the huge rusted hull of a ship--a fishing boat that was begun and never finished.

The lines of the boat are clean and sleek, and promise to guide easily through water. But today it sits helplessly grounded, awkward and anomalous among the cars and trucks that come and park beside it and then shift away in jerky, graceless spurts, the way motor boats move on the ocean.

Those that work in its shadow--the men who clam or pack clams or cut fillets out of fish sent down from Massachusetts--ignore this most pristine of vessels, this wreck untouched by seawater. But they all understand its unfulfilled promise. They know it is a monument to the times. It is as if the God of fishermen had commanded Noah to build, and Noah had begun, and picked his way slowly along the pier, avoiding the holes, and hopped into the pretty, vinyl-blue tourist vessel that floats at the end of the harbor, next to the sidewalk along Park Boulevard; as if Noah had chatted with the other tourists, eaten popcorn and hot dogs and sipped gin, and then gone out for a spin on the waters.

Fishing is a dilapidated, retarded industry in New Jersey, and it needs a flood. If the vast cleansing waters do not descend, if there is no new world created, the present industry will splinter and rot until nothing remains--not docks, boats, fish or fishermen.

The decline in available fish has been appalling. John Shaw, a lobster pot fisherman from Atlantic City, recalls that in the old days "the problem wasn't catching fish; it was selling them. We caught too many." Today the situation is reversed. All edible fish are sold, and rising prices help to compensate for diminished fish stocks. But the time may come, regardless of price, when there is nothing left to sell.

Last year New Jersey fishermen landed 126 million pounds of fish, slightly more than

Mr. Kazan is a free-lance writer. Article appeared in 'Today,' Sunday Magazine of 'Philadelphia Inquirer,' Aug. 17, 1969.

their fathers and grandfathers caught in 1901. But last year more than half the fish landed were inedible--caught for industrial use. The 1901 catch, made with the most rudimentary equipment, included at least 12 million more pounds of edible fish than the 1968 catch.

So it goes. The New Jersey fishery reached its peak level, 540 million pounds, in 1956. But almost 90 percent of that catch was menhaden, a fish caught for processing into such products as animal feed, lipstick and linoleum. By 1956, most edible fish were becoming scarce.

That trend has become precipitous in the past seven years, following the heavy storm of 1962. Since then virtually every species of finfish, including menhaden, has declined drastically. Porgy and fluke (a kind of flounder), which have been the mainstays of the local industry for the past decade, are being caught at less than a third of their former levels. Only higher prices and an increase in available shellfish--lobsters, surf clams and scallops--have allowed the industry to survive.

Fishermen regard the depletion of the seas with alternating moods of indignation ("Why doesn't the government help? It pays the farmers not to plant, but it doesn't pay us not to fish.") and equanimity ("It's a fading life like anything else.") Fishermen accept whatever fish come into their nets, whatever money comes to their pockets. The sea, the work, is always there, beckoning; and it's like a boxer missing his opponent, it's just as much work to catch nothing. Besides, as one dock owner says, "Many fishermen think like I do. Fishing may be dead here in 20 years--but so will I."

As docks are old, as boats are old (more afloat today were built before 1925 than since 1960) so are the fishermen. They look like the backbone of the Social Security system, these old men of the sea, and they walk on land with the easy rocking rhythm of the water. They will haul in a net on the day they die; and those that won't, the ones who come ashore first, do not retire to their homes and wives; you see them packing fish on the dock or running the pulley that unloads the catch. When they get too old for that, they stand and watch. They say it gets in your blood.

Most have had it in their blood all their lives. They started fishing because they went to sea in the Navy and liked it, or because they lived in the neighborhood and watched, or because their fathers handed them a mop and said to swab the deck.

They've fished ever since. It shows in the clear blue eyes, the skin thick and wrinkled like a turtle's, the testy sinuous strength that gives a man of 60 the vigor of someone 30 years younger.

It shows too in their language, which is rough, and in their use of it, which is simple and direct. A fish can't be sweet-talked or hustled. You can swear at him if you want to make yourself feel better, but there's no use lying or prevaricating. The only truth a fish understands is your net.

The truths of fish and net are primitive ones without a visible financial future. They have nothing to do with tax benefits or stock transfers, with health insurance or early retirement plans. It is not hard to see why most "younger" fishermen turn out to be 40, and why young men who used to go to sea, today go to college. A few still move from the Navy to the fishing boats, but there is a shortage of men on the docks, and sometimes a captain has to wait a week to gather a crew. The eager boys from the neighborhood are gone, and today when a captain takes his son on board, he hopes the boy will get seasick--and sea-weary. Only in small towns like Wildwood does the old familiar pattern hold true. There you can still see a 12-year-old boy scrubbing the deck after the boats come in. You ask him about the day's catch and he frowns: "I don't know. Ask my father; he's the captain."

But even most old-timers say they wouldn't go into the business today. And then they glance toward the water, shrug, and smile--as if to say that it's not a business, it's a way of life, and they're glad they had the chance to live it.

As much as the financial prospects, that way of life may discourage younger men. Sig Hansen, a big ruddy Norwegian who worked at sea for 52 years and now manages a fishing cooperative at Point Pleasant, says: "Some young men still come and say they want to go fishing, but one trip out and you don't see them any more. They get seasick. Besides, the younger generation wants to sleep."

A fisherman does his sleeping on shore. As soon as his boat leaves land, he tows his net 24 hours a day as long as he's out there--three to ten days. At night he tries to sneak three or four hours sleep while one of the nets is in the water--and while the rest of the crew checks the last tow for "trash," fish that can't be sold and have to be thrown back.

Of course not all fishermen go out for a week at a time. Most clam dredgers work on "day boats" that come in every night, but they stay out for 13 hours--from four in the morning until five in the afternoon.

Nobody says the life is easy. They say it's strenuous. They say it's hazardous, too, both physically and financially. Every time out you run the risk of being rammed at night by a larger vessel, or being caught in rough seas that may throw a man overboard or sink a boat. Seven boats from southern New Jersey were lost in the 1962 storm.

As if these worries weren't enough, you never know when you may snag your net and wire and lose both (value--$1000). Or when your technical equipment may break down and send you home early. Or when you'll have a "broker," a trip that doesn't pay for supplies. And when you come home with a boat full of fish, sure of your fortune, you may find that the price has dropped from 30 cents a pound to 10.

For all the uncertainty, fishermen still make what they call, simply, "a living." In a very good year a captain can clear around $18,000, and a member of his crew about half that. But the rewards, the fishermen say, are largely intangible--the beauty of the sea in the summer, three months out of 12; the sense that each trip is a mystery, a bout with fortune; and the firm self-respect that comes from working for yourself (every crew member gets a percentage) and yet being part of a crew.

Fishermen are among the last of the hardy, independent Americans--the last frontiersmen. The captain of a boat in Atlantic City explains: "You take a guy on my crew and put him behind a desk, and nine times out of ten he'll get fired. When he's out there he doesn't have to punch a clock, to get here at nine and leave there at five. He's working for himself. He's more his own boss. Of course, the skipper makes the decisions, but he consults the crew. And everybody on board knows that the better the gear is, the more fish he'll catch and the more money he'll make."

The interdependence of a fishing crew acts as a powerful communal force. It molds the men into a unit that has much of the cohesion and the spirit of a Navy boot camp or a high school locker room. The men rag each other with the same raucous enthusiasm:

"Look sharp? You couldn't look sharp if you had your face lifted. I feel good because as long as you're alive I know I'm not the ugliest guy in the world."

And out on the water the communal feeling increases; it extends beyond the limits of any single boat. Fishermen lend each other equipment, assistance, and advice on where to fish. If you need something, it's a long way--often a hundred miles--back to shore.

This spirit even encompasses the foreign boats that have moved into our coastal waters during the past ten years. Much has been written about resentment toward these boats, especially toward the most numerous ones, the Russian trawlers. But the fishermen themselves--American or Soviet--are more likely to wave than to curse at each other. Our fishermen say, "They're trying to make a living just like we are. They're catching fish to feed people."

At times the Russian boats also have been blamed for the decline in available fish, so much so that an agreement recently was reached which prevents Soviet vessels from fishing for the most valuable edible finfish.

But the Soviets made the agreement because they weren't interested in these fish. They knew that such species were on the decline, and they brought their large vessels here to fish for plentiful varieties, like herring and hake, that can't be sold in this country. Russian boats may be retarding the recovery of the best species, but they are not responsible for the present depletion.

Probably no single factor is responsible, but every man in the business looks for a primary cause. This is the ten-million-dollar question--the industry's present value; and every man comes up with his own answer. Vernon Rise, manager of a menhaden plant in Wildwood, said, "The decline started in 1963, right after the big storm. I still say

that had something to do with it. The storm changed the bottom out there."

Sig Hansen, Point Pleasant fisherman: "I lay it to overfishing. We've been doing it for 20 years. The Russians will leave soon. You can bet they won't come 4000 miles for nothing."

Warren Lund, former fisherman, now a Cape May dock owner: "Fishing's not dying out. It's changing like any other small business. Fish protect themselves. When they start getting caught, they move. The porgies and the fluke are leaving, so we'll have to create a demand for something else. Like mackerel. We have more mackerel now than I've ever seen."

Alfred Jones, Atlantic City dock owner: "We're killing all the young. The government should pass laws requiring a certain mesh size on the nets and prohibiting sale of anything smaller. What would happen to human population if we destroyed all the young males?"

"Captain Jack" Lawson, itinerant fisherman: "You used to be able to get croakers all day long--now they're down off Mississippi. We're catching scallops here that used to be off Nantucket, and they're getting Boston mackerel in the Chesapeake Bay. Either the water's getting colder or the equator's moved."

The government laboratory in Woods Hole, Mass., reports that ocean temperatures have been dropping for 15 years, but they say the trend may have stopped. The cooler waters here account for the increase in available shellfish.

If New Jersey alone were registering declines, some local cause (foreign boats, the storm, colder waters) might be held accountable. But decreasing fish stocks is a national problem. The United States now supplies less than a fourth of the fish she consumes. Once second in the world in total poundage, she is now sixth.

So as our primary cause we must look for a national problem, and the one explanation most often cited by fishermen is that ubiquitous and invisible destroyer, pollution--industrial, detergent, human, and agricultural (pesticide) pollution.

Captain Dave Hart, who had his own commercial boat for 18 years and now works for various government agencies, documents a persuasive case against pollution: "The species that don't use the inland estuaries for spawning--herring, hake, whiting--all seem to be in good shape. The porgies, the fluke, the sea bass, all the ones that use the estuaries, are declining. Of course there has to be an exception: Striped bass spawn in the estuaries and they're more abundant than ever. But the overwhelming patterns points to some sort of pollution."

A possible solution to this problem comes from Harry McGarrigel, dean of the Atlantic City dock. ("Me and my father before me. We've been on the street since 1911.") Harry is a heavy, friendly man. As he sorts fish on his dock he looks like the owner of a New York delicatessen, but his friends note with pride that he went to Washington to help negotiate the treaty with the Russians. Harry McGarrigel says, "All we need is $35 million dollars to pipe all that waste out to sea and then things will be straightened out, after about ten years. It'll take that long for the water to clear up."

However long it would take for the waters to clear--and ten years probably is an extreme prognosis--the fishermen need someone to begin the process. That someone probably will have to be the Federal Government. States take little interest in fishing--they don't even collect statistics, and what interest they do take varies. New Jersey has a law, poorly enforced, prohibiting sale of small fish; most Southern States have no such statute.

Compared to other nations, even our Federal Government pays negligible attention to its fishery. Foreign countries build and man enormous fleets complete with the most modern equipment; our country authorizes Small Business loans. Besides the loans, the U.S. Bureau of Commercial Fisheries confines its activities to periodical bulletins on fish sightings and prices, and to research. Thus far the predominant product of the research has been expensive new equipment that small fishing boats cannot afford. But recently the government has been developing a new product that may help revitalize the industry.

Fish Protein Concentrate (FPC) is an odorless, tasteless fish flour made by

reducing six pounds of whole fish into a pound of fine powder. Because FPC converts the whole fish, it retains every one of the 30-odd amino acids that are the main components of protein. The result is a product that is 75 percent protein--and that could do much toward relieving under-nourishment throughout the world.

Other countries, like Norway and Sweden, already have begun to produce FPC. The United States is now building its first plant. Although the Food and Drug Administration has approved only hake-like species for the pilot project, all signs indicate that it will soon approve all species.

If so, this would mean that the great mass of trash (sea robins, dogfish, sharks) as well as the abundant species the Russians are catching (herring, hake, mackerel) could be harvested. The boats that would go for such fish would have to be enormous company vessels, too large to be owned by the captain, too expensive and mechanized to hunt for fish in the old, romantic and desultory fashion. The men who worked these boats would live something like today's clammers or menhaden fishermen. Their work would be more routine, more like drudgery and less like sport, than the life of today's finfishermen. The sea is full of trash.

But there is a possibility that the small boats may linger on. Captain Dave Hart from Cape May explains, "Up to now we've done our damnedest to destroy the natural ecology of the sea. We've taken the good fish and let the weeds flourish. If we start to fish for trash we may restore the natural balance."

He goes on to describe what may happen then: "If the finfish do come back, they may do so very suddenly. Fish can reproduce like insects. Scientists opened up one striped bass and found three million eggs."

If the finfish return in vast numbers, large vessels probably will be constructed to fish for them. Such boats already operate out of enormous fishing ports like New Bedford, Mass. If comparable boats come to New Jersey, then the small independent boats, like the local grocery store, will die out. But if the valuable finfish increase in limited numbers, if catching them remains an uncertain and speculative venture, construction of larger boats would be too risky. Then the small boats might survive.

No one can be certain what will happen. It seems that fishing's future is largely in the hands of the Federal Government. If it demonstrates that FPC is a feasible product, it may help create a new industry. But the real problem probably is the estuaries. The government must weigh America's traditional agricultural-industrial perspective--the one that ultimately leads to contaminated estuaries--against a future in which man may have to depend on his marine resources for food.

But the sea is a mystery. Next year, the year after, the fish may return. They've done it before. "Captain Jack" Lawson says," Anyone who thinks he knows anything about the sea is a damn fool." The fishermen have a saying to express this. Ask one of them anything about fish and he'll answer, as often as not, with a shrug--and then he'll add: "They have tails, and they swim."

But every fisherman changes the expression a little to suit his personality. "Captain Jack" is 67 years old, a lithe, spunky little Virginian who speaks with a Boston twang from fishing there for many years. He says, "Fishing's deteriorating just as fast as you can push it down the hill. Don't ask me why. They have fins and tails; they go where nobody knows."

Will the fisherman go, too? Probably in one guise or another, he will remain. The captain of a boat in Atlantic City says: "Today I'm a bum because I make a living from the sea. People hear I'm a commercial fisherman and they turn up their noses. They're snobs. Some day--I may not live to see it--the man of the sea will be respected. He'll provide the food that the world will subsist on."

FREEZING & IRRADIATION

"Freezing and Irradiation of Fish," edited by Rudolf Kreuzer, Fishing News (Books) Ltd., Ludgate House, 110 Fleet Street, London EC4, England, 1969, 528 + xvii pp., illus.

This is a record of the FAO Congress on the Freezing and Irradiation of Fish, Madrid, September 1967. The intention of the Congress was to provide the latest and most complete knowledge about the merits and capacities of refrigeration practices as a contribution to fuller utilization of the world's fishing catch for human food. While essentially scientific, this volume should be of enormous practical importance to all fish processors and distributors.

The book, divided into six main parts, includes 80 papers from probably the most experienced and authoritative scientists and technicians in the world. Much valuable and informative material from session discussions has been included.

The 6 main parts are:

1) Freezing fish at sea; techniques and equipment, factors affecting quality, freezing media, and superchilling.

2) Freezing and processing of frozen fish; physical effects of freezing, specific problems and techniques, effect of polyphosphate treatment, freezing tropical fish, and thawing of frozen fish.

3) Economics of producing and marketing frozen fish products; shore-based plants, economic considerations, and product development.

4) Quality of frozen fish products and its assessment; factors influencing quality and the measures of assessment.

5) Storage, packing, and distribution; design and operation of cold stores, and methods of packing and distribution.

6) Preservation by irradiation; quality, present status, production technology, and economic aspects.

FROZEN FISH

"Draft Code of Practice for Frozen Fish," Organization for Economic Cooperation and Development, Paris, 1969 (French and English), 74 pp., $1.80. Sold by OECD Publications Center, Suite 1305, 1750 Pennsylvania Ave., N.W., Washington, D.C. 20006.

This is a guide for industry on the treatment of fish and fish products before, during, and after freezing. It has been approved by the International Institute for Refrigeration and the OECD Fisheries Committee, and recommended to the WHO/FAO Codex Alimentarius Commission.

The code covers: raw material; freezing times and rates; sanitation and hygiene in handling and processing; packaging; storage; thawing; and transportation and retailing.

FROZEN FISH IN TRADE

"Market for Frozen Fish in OECD Member Countries 1964-1968," Organization for Economic Cooperation and Development, Paris, 1969, 120 pp., $3. Sold by OECD Publications Center, Suite 1305, 1750 Pennsylvania Ave., N.W., Washington, D. C. 20006.

The introduction of frozen fish as a commodity in international trade is comparatively recent. Modern mechanical refrigeration began in the late 1940s. By 1967, one million tons worth $400 million to the shippers had entered international trade.

This study concentrates on frozen products from groundfish caught in the North Atlantic fisheries. It includes specific studies of prices, product groups, production, trade, and consumption in the principal exporting and importing countries. There are fairly complete analyses of the situation in Canada, Denmark, Germany, Iceland, Norway, the U.K., and the U.S.--and shorter sections on France, Greece, Japan, Netherlands, Spain, Sweden, and Eastern Europe.

GEAR

"German One-Boat Midwater Trawl, Development Since 1959 to Beginning of 1968," by Joachim Schaerfe, 'Informationen fuer die Fischwirtschaft,' Vol. 15, No. 3/4, Hamburg 1968. Translation sold by Clearinghouse, U.S. Department of Commerce, Springfield, Va. 22151, 65 pp., $3 (microfiche 65¢). Order TT-68-50211.

Dr. Schaerfe is Chief, Gear Technology Section, Fishing Operations Branch, FAO. He describes the use of the one-boat midwater trawl in experimental work and in commercial fishing. The article also covers fishing conditions for herring, cod, hake, pollock, mackerel, and other species; fish behavior; fishing vessels, fishing efficiency and techniques; handling of catch on board; and gear--warps, trawl boards, bridles, front weights, headline floats, nets, and net sounders.

HYDRODYNAMICS

"Theoretical Hydrodynamics," by L. M. Milne-Thomson, Macmillan Co., New York, 1968, 743 pp., illus.

The science of hydrodynamics is concerned with behavior of fluids in motion. The object of this book is to give a thorough, clear, and methodical introductory exposition of the mathematical theory of fluid motion that will be useful in both hydrodynamics and aerodynamics. Dynamics of a frictionless fluid is a subject that has always been necessary to the naval architect.

As scientific theory becomes more exact, it tends to assume a more mathematical form. In a radical departure, the author has based his presentation consistently on vector methods and notation. The previous mathematical knowledge required of the reader did not go beyond the elements of infinitesimal calculus.

SONIC-SCATTERING LAYER

"An Investigation on Sonic-Scattering Layers; the R.R.S. 'Discovery' SOND Cruise 1965," by R.I. Currie, B.P. Boden, and E.M. Kampa, 'Journal of the Marine Biological Association of the U.K.,' Vol. 49, No. 2, pp. 498-514, 1969.

The SOND 1965 Cruise was designed as an ecological study of sonic scattering layers at a certain season in a restricted volume of ocean near the Canary Islands. The primary intention was to study the vertical distribution and migrations of animals in the upper 1,000 meters. Biological, acoustical, and environmental observations were essentially independent but closely coordinated. The scientists hoped the cruise could assess the potential of acoustical methods for general use in distribution studies and, at the same time, cast some light on the nature of acoustic scattering in the sea. This article is a preliminary report on the investigation and its methods.

The following, published by the Fish & Wildlife Service, Department of the Interior, are available from Division of Publications, BCF, 1801 N. Moore Street, Arlington, Va. 22209.

ALGAE

"Green Algae, Chlorella, as a Contributor to the Food Supply of Man," by Norman W. Durrant and Carol Jolly, Fishery Industrial Research, Vol. 5, No. 2, 1969, pp. 67-83.

Efforts to solve world hunger usually fall into two categories: 1) controlling population growth; and 2) increasing food production. Whenever the latter is considered, the possibility of large-scale culture of green algae arouses great enthusiasm. This paper is concerned specifically with the tremendous potential of algae for increasing food supply.

A primitive group of plants, algae are usually classified according to their color--green, blue-green, brown, or red. They all contain the chlorophylls essential for the production of organic matter. Brown and red algae differ considerably from green and blue-green both in size and structural complexity; their potential for artificial cultivation and effective use as food is less than that of green and blue-green.

The authors examine the supplies and utilization of all algae, but report on the green in greater depth--especially developmental investigations and production and nutrition studies.

BILLFISHES

"Billfishes of the Central Pacific Ocean," by Donald W. Strasburg, Circular 311, 1969, 11 pp., illus.

Swordfish

'Billfish' is a collective term embracing the various kinds of marlin, spearfish, sailfish, and the broadbill swordfish. These large fishes, some exceeding 1,000 pounds, are found in all warm seas. Despite their size, game qualities, and commercial potential, they are poorly known biologically. The data used in compiling this report were obtained from the records of the Hawaiian International Billfish Tournament, the Hawaii State Division of Fish and Game, and scientific literature.

PACIFIC MACKEREL

"Synopsis of the Biological Data on the Pacific Mackerel, Scomber japonicus Houttuyn (Northeast Pacific)," by David Kramer, Circular 302 (FAO Species Synopsis No. 40), 1969, 18 pp., illus.

Mr. Kramer has tried to assemble all existing knowledge on the identify (nomenclature, taxonomy, morphology), distribution, bionomics, life history, population, fishery, and protection and management of the Pacific mackerel.

SALMON & STEELHEAD

"Identification of Pacific Salmon and Steelhead Trout, by Scale Characteristics," by Kenneth H. Mosher, Circular 317, 17 pp., illus.

Identification of species of salmon (Oncorhynchus) and steelhead (Salmo gairdneri) in Pacific coast sport and commercial catches is important in assessing the relative production and value of each species. At times it may be necessary to determine the species from a portion of fish, such as a steak or fillet. Any scales on these portions offer a means of identification. The species differ from each other in their life histories, and some scale features clearly show this difference. Fishery inspectors, in the field or on shipboard, will be able to use this illustrated guide with a minimum of preinstruction.

OCEANOGRAPHERS

"Explorers of the Deep," by Donald W. Cox, Hammond, Inc., New Jersey, 1968, 93 pp., illus., $3.50.

This book should stimulate young people's interest in the oceans. It tells the stories of 18 "searchers of the sea"--biologists, geologists, engineers, and aquanauts--ranging from Ben Franklin, who was the first to study the Gulf Stream, to Willard Bascom, pioneer of the Mohole project.

--Barbara Lundy

INTERNATIONAL

British Sport Fishermen Blame Danes for Decline in Salmon Catch

British sport fishermen claim that poor 1969 salmon fishing in British rivers is due to Danish salmon catches off Greenland. They have started a campaign against the purchase of Danish products. Anti-Danish posters reading "Save our Salmon, Boycott Danish Food" have been displayed in the northwestern part of the country. English housewives are refusing to buy Danish butter and bacon.

Danish Ambassador Replies

Erling Kristiansen, the Danish Ambassador in London, said there is no evidence that Danish fishing off Greenland is responsible for the decrease in British salmon catches. Kristiansen is an avid sport fisherman himself. He added that about 1,500 metric tons of salmon are fished off Greenland annually, and 2,000 tons are caught off British coasts. In all probability, most salmon caught off Greenland originate from the rich Canadian salmon areas, he said. Kristiansen also called attention to the spread of ulcerative dermal neurosis (UDN) and the increase in illegal fishing with explosives. Danish trawlers also fish cod and halibut, and other countries fish in the area between Greenland and Scotland.

Charge Unproven

No one from the British Sport Fishermen's Organization has been able to establish any connection between the Danish fishery and the decrease in British salmon stocks. However, British sources point out that, at two conferences held this year in London, Denmark voted against prohibiting open sea salmon fishing. Sweden and West Germany also voted against a prohibition. ('Berlingske Tidende' and 'Børsen,' July 12.)

OECD Reviews 1968 Fisheries

Again in 1968, there was a slight overall improvement in North Atlantic and North Pacific fish catches. The increase resulted from better catches of fish for direct human use (up about 6%). The production of fish for reduction to meal and oil was smaller than in 1967 (down 4%) mainly because some herring fisheries failed.

On the whole, marketing conditions for bulk catches continued unsatisfactory. So fishermen often were no better off then in 1967, a year of poor returns.

OECD Review

The main 1968 fishery developments in the northern hemisphere are described in a Review of Fisheries in countries of the Organization for Economic Cooperation and Development (OECD): Belgium, Canada, Denmark, France, W. Germany, Greece, Iceland, Ireland, Italy, Japan, Netherlands, Norway, Portugal, Spain, Sweden, Turkey, U.K., U.S. These provide about half the world's fish supply and handle around three-quarters the global trade in fish and fish products.

Northern Countries Hurt

Affected most by low prices were the more northern countries: Iceland, Norway, Greenland, and Canada. Their fisheries depend considerably on outlets for frozen cod and similar species, and for fish meal and oil. These products all figure prominently as commodities in international trade and all were affected by poor demand.

In isolated cases--Denmark's reduction industry, for example--it was possible to increase productivity. As a rule, however, the condition of North Atlantic fish stocks allowed only marginal improvement.

More Government Aid

One outcome of the prolonged market depression is that governments have provided more financial aid. How many additional

provisions and their possible repercussions on international trade are now being examined in OECD by the Committee for Fisheries.

Market for Coastal Catches

In 1967, the adverse conditions in the external market had not affected unduly internal demand for high-quality fresh fish caught by coastal water home fleets. This was repeated in 1968. The OECD Review notes the high rate of vessel renewal in this sector--usually a reliable indicator of good economic health. (OECD, June 25.)

World Fish Meal Production and Trade Set Records in 1968

"World Agricultural Production and Trade," July 1969, published by the U.S. Department of Agriculture, contains this summary of world fish meal production and trade in 1968:

SUPPLIES

World fish meal exports (including meal equivalent of fish solubles) were a record 3.9 million short tons in 1968. This was a rise of 694,200 tons, or 22%, from 1967--and more than double the 1960-64 average. The marked increase reflected chiefly Peru's record anchovy catch. Also contributing were substantial recovery in Chile's catch and further expansion by Denmark, South Africa, and South-West Africa. However, herring exports from Norway and Iceland declined sharply.

World production increased by 330,000 tons, or 6.6%.

On Dec. 31, 1968, aggregate stocks of fish meal in primary exporting countries were estimated to be sharply lower. This was evidenced by the fact that world exports in 1968 increased nearly 400,000 tons more than production. In 1968, exports were 73% of 5.3 million tons produced; this compared with 64% in 1967--and only 60% during 1960-64.

IMPORTS

In 1968, fish meal imports into major markets of nearly 3.5 million tons expanded at an accelerated rate: nearly 24% above 1967. The average annual increase in imports during 1962-68 was 13.2%.

During 1960-68, aggregate imports by some countries have been substantially less than world exports. The annual unaccounted margin, though erratic, has widened sharply. A sizable part of unexplained difference was due to increased imports by nonreporting countries in Eastern Europe.

Of the 66,400-ton net increase in 1968 fish meal imports, the U.S. accounted for 30%, the European Communities countries 22%, the United Kingdom 16%, and Japan 10%.

U.S. imports, the largest market, were up 31% in 1968 to 855,800 tons, or 24.5% of aggregate. This compared with 23.1% in 1967 and only 15.4% in 1962.

In recent months, U.S. imports have declined. This reflects sharply higher prices for Peruvian anchovy meal. In January-May 1969, U.S. imports were only 203,144 short tons--compared with 327,000 tons in 1968 period. However, imports into West Germany--the second largest market--were steady during January-April at 218,500 tons. This compared with 216,200 tons in the 1968 period.

PRICES

The price for fish meal has increased substantially since Jan. 1969. In early July, it was US$168 a short ton c.i.f. European ports, or $36 above the same period a year ago, and $47 above the 1968 average annual price. Compared with a year ago, soybean meal prices have not changed appreciably. Therefore, fish meal has become less competitive with soybean meal. This could result in some shift toward heavier use of soybean meal in livestock and poultry rations.

CURRENT SITUATION AND PROSPECTS

Output in major producing countries through May 1969 was slightly less than in 1968 period. Exports were nearly equal to 1968 period despite stocks in major producing countries that are about a quarter-million tons below last year's.

Stocks are expected to be drawn down even more sharply before Oct. 1, when supplies from the 1969/70 season in Peru start moving into export. Since 1963, Peruvian production

in the Oct.-Dec. quarter has been erratic. It ranged between 366,000 in 1963 and 806,000 tons in 1967. Peruvian fish meal production during Oct.-Dec. 1968 was 659,000 tons. In the past, sharp price fluctuations have taken place in the Oct.-Dec. quarter; in 1967, European prices in Nov., at $120 ton, were down $35 a ton from Sept.

Record World Fish-Oil Production & Exports in 1968

In 1968, net exports of fish oil (including fish liver oil) were 757,800 short tons, or 42,100 tons above 1967 and more than double the 1960-64 average. The increase reflected phenomenal expansion in exports of Peruvian anchovy oil and South African pilchard oil; these were largely offset by sharp reductions in herring oil from Norway and Iceland. Much of overall increase in exports of fish oil reflected heavy disposal of stocks. These had been largely built up during big bulge of 1967.

1969 Outlook Clouded

The outlook for 1969 production is clouded as usual by several major uncertainties. The basic question continues: Will low Peruvian anchovy oil yields and a possibly smaller catch there--and reduced quota on S. African pilchard and herring scarcities in Norway and Iceland (if they continue)--more than offset expected increases in oil output from Chile and Denmark? Any substantial recovery by Norway and Iceland could result in another overall increase; if it occurs, it would set a new record.

Export Decline Expected

Although fish-oil output may continue near 1968 record, exports are expected to decline somewhat in 1969. Peru's exports, which in 1968 exceeded production substantially, are expected to be a major factor influencing this decline. However, movement from Chile and Denmark could increase somewhat. Exports from Iceland and Norway will likely remain substantially below 1966. Exports from S. Africa and South-West Africa are expected to continue large, but these may be somewhat below 1968 record. Sharp spurt in 1968 production of pilchard oil from S. African factoryships might not be matched in 1969 due to quota restrictions. In long run, key factor there will be whether present catch limit for pilchard can be maintained without depleting stocks.

Aggregate exports from major producing countries are running substantially less than in 1968 period.

Fish Oil Exports & Prices

In 1968, record fish-oil exports resulted in markedly lower prices. These averaged about 4.5 U.S. cents a pound for Peruvian, semirefined, c.i.f. European ports, compared with 5.8 and 8.9 cents in 1967 and in 1966.

However, prices in recent months have strengthened to 6.1 cents in June and early July. Although prices for most other oils also have strengthened from a year ago, price spreads or discount for fish oil in relation to most competing oils have narrowed substantially. Thus, fish oil prices have become less competitive in world markets. The notable exception is palm oil. This declined to about 7.3 cents a pound, Malaysia 5% bulk c.i.f. Europe, in July, compared with 7.8 cents a year earlier. ('World Agricultural Production and Trade,' U.S. Dept. of Agriculture, July.)

1968/69 Whale Catches in Antarctic & N. Pacific Reported

On June 13, 1969, the Japanese Fisheries Agency published data on 1968/69 whale catches in the Antarctic and North Pacific Oceans.

The 1968/69 Antarctic catches reflect about a 50% increase in fin whales over the previous season--but a 50% decrease in sei whales.

The Soviet Antarctic catches show practically no change for fin whales--but a decrease of 287 sei whales.

In the 1968 North Pacific mothership whaling, fin whale catches decreased 20% from previous season, sei whale hauls increased 10%, and sperm whale catches were virtually the same. ('Suisan Tsushin,' June 16.)

1968/69 Antarctic and North Pacific Whale Catches					
Type of Operation	Catch Quota	Catch			
		Fin Whale	Sei Whale	Total	Sperm Whale
	BWU1/	. . . . . . (Number)		BWU1/	Number
Antarctic mothership:					
Japan.	1,493	1,821	3,495	1,493	0
USSR.	976	1,194	2,275	976.16	Not Available
Norway.	731	0	0	0	0
Total	3,200	3,015	5,770	2,469.16	
North Pacific mothership:					
Japan.	-	729	3,819	1,001	3,000
USSR.	-	1,062	1,100	714.33	9,526
Total		1,791	4,919	1,715.33	12,526
North Pacific land station:					
Japan.	-	53	977	189.33	3,747
US	-	38	14	21.33	84
USSR.	-	0	0	0	0
Canada.	-	0	0	0	0
Total		91	991	210.66	3,831

1/Blue-whale units.

Japan to Aid Indonesian Fishery Research & Training

Japan has signed a 3-year agreement with Indonesia to provide technological and material cooperation for Indonesian fisheries research and training projects, according to the Foreign Ministry. The agreement is part of Japan's official program of technological cooperation with Indonesia.

Japan will send 4 fisheries experts and provide some machinery and equipment for Indonesian fisheries research and training institutes. ('Japan Times,' July 11.)

IAFMM Conference Held in Cannes

The International Association of Fish Meal Manufacturers (IAFMM) celebrated its tenth anniversary at the 9th Annual Conference, held in Cannes, October 6-10. Over the past 10 years regular conferences have been held where producers and scientists advising the industry meet to discuss matters of mutual interest. The Executive Council and the Scientific Committee also meet at least once a year between conferences.

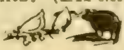
Member Countries

IAFMM member countries are Belgium, Canada, Chile, Denmark, France, Germany, Holland, Iceland, Morocco, Norway, Peru, Portugal, South Africa, Sweden, U.K., and the U.S. Other major producing countries are invited to participate in conferences as observers.

IAFMM Activities

The Association does not engage in actual marketing or price questions. It is primarily concerned with assembling economic, statistical, and general marketing information. The Scientific Committee constantly examines methods of improving processing and quality control to ensure production of high-quality fish meal. The Association has liaison status with FAO, and FAO representatives participate in all conferences and meetings. It cooperates with the Fish Meal Exporters Organization (FEO) in market promotion and technical activities. It maintains close contact with leading fishing industry research institutes.

A symposium for compounders was held in Amsterdam on October 2. Scientists, producers, and technicians in the compounding industry presented papers on fish meal processing, assessment of protein quality, fish meal in poultry rations, fish meal in pig rations, and new developments, such as the use of anti-oxidants. (IAFMM, Aug. 4.)



First Fish-Inspection Conference Held in Canada

The Technical Conference on Fish Inspection and Quality Control, organized by the Food and Agriculture Organization in cooperation with Canada, concluded an eleven day session in Halifax on July 25. About 250 delegates from 45 countries participated.

General Agreements

The Conference, first of its kind, examined the scientific, technical, and legal aspects of fish inspection and quality control. It agreed on the need for efficient, scientifically based inspection systems to assure the highest quality of fish and fish products in the interest of consumers and the fishing industry. It was emphasized that better quality control would also help to reduce wastage and facilitate exports, especially by developing countries.

Individual Country Programs

It approved recommendations to establish suitable inspection programs in individual countries, including education and training of personnel. The Conference discussed the question of whether fish-inspection programs should be voluntary or mandatory; it decided this depends on circumstances in each country. In any case, it was emphasized that there should be "no compromise in matters affecting public health".

Glossary

The Conference also recommended that FAO publish a glossary of terms used in fish inspection and quality control which could be applied internationally. The glossary would facilitate understanding by establishing a common language in a very complicated field.

Spoilage

Finally, the possibility of detecting fish spoilage through chemical means was noted. The most promising is trimethylamine, which develops during spoilage of fish, though this method applies only to certain marine species.

Some speakers called for greater research into fish spoilage and development of quick, efficient methods for its detection. Others, especially from developing countries, emphasized the need for education and training. The participants agreed that the trend is towards more stringent standards for fish quality, and that consumers are becoming more demanding. C. H. Castell, Fisheries Research Board of Canada, predicted that spoilage of fish after catching will be reduced to insignificance eventually, thanks to modern scientific advances; also that consumers will enjoy the same high standards for fish and fish products they now expect and get from meat and poultry products.

General Topics

Almost 100 papers on various aspects of fish inspection and quality determination were discussed. General topics were: the need for inspection and quality control; national fish-inspection programs; general principles and program development; industrial advantages of inspection and quality control; research reports on methods for quality assessment.

USSR Conducts Joint Oceanographic Research With Japan & France

The first Soviet-Japanese oceanographic research team, aboard the 'Hakiko Maru', concluded a 1-month study of the Sea of Japan seabed on June 28. Thirty scientists from the Soviet Academy of Sciences' Institute of Oceanography and oceanographers from Japanese universities conducted geological and geophysical research to obtain data on the origin of the Sea of Japan.

Soviet-French Research

A party of Soviet and French oceanographers left Sevastopol, USSR, on June 28 for a joint research cruise in the Mediterranean. The French scientists went aboard the 'M. Lomonosov' of the Ukranian Academy of Sciences' Marine Hydrophysical Institute. At the same time, Soviet scientists entered an underwater laboratory designed by Jacques Cousteau for joint underwater research. Both programs are part of a French-Soviet Scientific Cooperation Agreement.

FOREIGN

CANADA

FISHERIES MINISTER URGES INCREASED PENALTIES FOR FOREIGN VESSELS FISHING INSIDE 12-MILE LIMIT

Canada should increase the penalties levied against foreign vessels caught fishing inside the 12-mile zone, says Fisheries Minister Jack Davis. He believes current maximum fines under the Coastal Fisheries Protection Act "are not a sufficient deterrent. We should be free. . .to extract greater penalties for repeated offenses." Maximum fines now are C$5,000 for a summary conviction, or $25,000 for conviction on indictment.

4 Vessels Fined

Davis said the maximums are outdated, but declined to spell out what he considered would be reasonable fines. The highest penalty levied this year, against a Japanese vessel caught inside the limit off British Columbia, was $3,500 and loss of catch. Another Japanese boat and two Russian trawlers were fined $2,500 each.

The Minister said the matter of increased fines would probably come up at the next sitting of the Commons in Ottawa. "At the very least we should bring all the legislation up to date," he added.

What Act Provides

Under the act, it is an offense for a foreign fishing vessel to be inside the limit, except in case of emergency. The act also provides for confiscation of fish, boat, and gear. "The confiscation of the catch inside territorial waters will continue," Davis said. (Canadian Embassy, Aug. 26.)

* * *

SOVIET TRAWLERS SEIZED AND FINED

On August 4, a Canadian Fisheries Enforcement vessel seized 2 Soviet medium side trawlers 9.4 miles off the Canadian coast. Both vessels were within the 12-mile limit, near Cleland Island, west of Vancouver Island. The captains and crews were arrested, and the 'Gherman Titov' and the 'Kuzachin' escorted to Victoria, B.C., for inspection and legal charges. Canadian law allows a maximum fine of C$5,000. The vessels may be confiscated.

Captains Fined

On August 11, the Victoria Court fined each captain C$2,500. Both pleaded guilty, blaming their violation on nets threatening to foul the propellers and the strong onshore current. Both also claimed that Soviet vessels have standing instructions to remain a minimum of 1.5 miles seaward of the 12-mile limit. Although no fish were found on board, the Court contended that the vessels were preparing to fish because their nets were in the water. The Canadian press noted that this was the first time Soviet fishermen had been found guilty of fishing illegally in Canadian waters. (U.S. Consulate, Vancouver, Aug. 4 & 11.)

* * *

SALMONID IMPORTS RESTRICTED

A new Canadian law prohibits imports of live or dead salmonids or salmon eggs, unless they meet specific requirements, to protect against the spread of disease. Similar legislation became effective in the U.S. in mid-1967.

The New Law

The Canadian legislation defines 'salmonid' as fish of the family Salmonidae. Live or dead salmonids, or salmonid eggs, may be imported only if (a) they have been processed by a method that destroys the protozoan 'Myxosoma cerebralis' and the virus causing viral hemorrhagic septicemia; or (b) they are accompanied by a certificate, signed by a fisheries pathologist in the country where the fish were caught, stating that the fish or eggs are free of 'Myxosoma cerebralis' and the viral hemorrhagic septiciemia virus. A specimen of the pathologist's signature must be filed with the Department of Fisheries and Forestry in Ottawa.

The regulations do not apply to salmonids caught in the wild in North America. ('Fisheries Council of Canada Bulletin,' July-Aug.)

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Canada (Contd.):

KELP PROCESSING STARTED IN BRITISH COLUMBIA

A 1,000-ton kelp cutter vessel has been launched and a plant built at Masset on Canada's Queen Charlotte Islands to process 40,000 short tons of kelp this year and 200,000 tons in 1970.

The product will be algin, used in ice cream, chocolate milk, cheese, icings, salad dressings, candy, puddings, aspirin tablets and other pharmaceuticals, paint, tires, food packages, and adhesives. Also produced will be kelp meal for fertilizer, animal feed, and for humans.

The New Plant

At the new plant, chopped kelp will be pumped from the harvesting vessel into two 600-ton-capacity storage tanks. From there it will be washed in fresh water and fed into shredders. The shredded kelp will be led into a hot air stream. A collecting cyclone there will drop the diced kelp into a 50-ton silo. From the silo the kelp will be ground and bagged.

Storage capacity of the warehouse is 2,000 tons of bagged kelp meal in pellets.

Each ton of wet kelp harvested will produce two 100-pound bags of kelp meal; 2,000 pounds of dried kelp meal are required to extract 400 pounds of algin.

No Canadian Market Yet

According to the British Columbia Research Council, the market for alginates in Canada has not been established. Gross sales of seaweed colloids in the U.S. have been estimated at $10-$20 million a year. ('Sea Harvest and Ocean Science,' Aug.-Sept.)

* * *

FIRST-HALF 1969 MARITIME PROVINCES' LANDINGS ABOUT SAME AS 1968

Landings in Canada's Maritime Provinces for first-half 1969 were 427 million pounds worth C$34.4 million. Statistics for the same period of 1968 were 431 million pounds, C$33.3 million; for 1967, 299 million pounds and C$25.3 million.

June 1969 Catch

June 1969 landings were 140.4 million pounds worth C$11.5 million. Included were 51.6 million pounds of groundfish, C$2.5 million; 73.1 million pounds of pelagic and estuarial species, C$7.1 million. The quantity and value of the June catch were above June 1968 by 27.4 million pounds and C$2.3 million. The catch also was above the 3-year (1966-1968) June average by 35.8 million pounds and C$2.8 million.

Species & Vessels Used

During June, landings of cod, redfish or ocean perch, flatfish, mackerel, herring, swordfish, scallops, and lobsters were above the 1966-1968 June average; landings of haddock, halibut, pollock, and salmon were below the 3-year average.

Landings by trawlers and draggers over 70 feet long totaled 29.1 million pounds. Their catch represented 53.7% of groundfish landings and 85.8% of scallop landings. (Department of Fisheries & Forestry, Halifax, N.S., July 24.)

* * *

FISHING RETURNS TO NORMAL IN NEWFOUNDLAND'S PLACENTIA BAY

Normal fishing resumed in Newfoundland's Placentia Bay, Jack Davis, Canada's Fisheries and Forestry Minister, announced. Phosphorus pollution from the plant at Long Harbour forced closure in early May of a large Bay area. The fishery was reopened June 16. Since then, the Department bought all fish.

The area's fishery products have been declared safe for human consumption. The Department's purchases were scheduled to end July 12. Its 'buy program' permitted smooth transition to normal operations.

Fish Tested

All fish at time of closure were bought by the government and destroyed. Fish caught after the reopening on June 16 have been purchased and held by the government to permit exhaustive tests by the Food and Drug Directorate of Department of National Health and Welfare. (Canadian Dept. of Fisheries and Forestry, July 1.)

EUROPE

United Kingdom

LARGER FISH SUPPLIES
EXCEED DEMAND

Britain's deep-sea fishermen increased their catch in 1968, but supply was not matched by demand. The White Fish Authority (WFA) announced this in its report for the year ended March 31, 1969.

All 3 sections of the deep-sea fleet increased landings. But only the middle-water operators escaped a drop in revenue. The average value of landings by deep-sea vessels declined more than 3%.

There are 3 categories of vessels in the deep-sea fleet: distant-water (more than 140'), middle water (110' to 140'), and near water (80' to 110').

Deep-Sea Fleet Declined

During 1968, the deep-sea fleet lost 34 vessels. WFA approved only one grant to construct a vessel more than 80 ft. long. Its report states: "It is to be hoped that improved profitability, assisted by the new subsidy arrangements, will encourage owners to undertake new building during the coming year."

Inshore Fleet

For the inshore fleet, it was a more favorable year. Landings were slightly up. The average value was 5% above 1967. One seiner and 63 trawlers were added to the fleet.

Fresh & Frozen White Fish

In 1968, supplies of fresh and frozen white fish, excluding shellfish, were 929,559 metric tons worth US$175 million. Of that, imports were 165,966 tons valued at US$44 million. Compared to 1967, supplies increased 36,311 tons and value US$5.7 million; increased imports accounted for 20,760 tons worth US$4.6 million.

Of 383,000 tons used for fish meal, 232,200 tons were offal, 1,600 tons condemned fish, and 59,000 tons surplus fish with no buyers.

Fish Exports

Fish exports rose more than 6,000 tons (21%). This was an increase of 22% in value to US$21 million. Shellfish landings were worth US$11.6 million, compared with US$9.6 million for 1967.

Loans to the industry during 1968 were US$1.3 million. These included US$1 million for construction and replacement of motors of inshore vessels. US$355,000 went for processing and ice plants. Gross expenditures on grants for vessels were US$8.6 million. (Charles Barker City Ltd., June 24.)

* * *

RANGER CO. PLANS INCREASE
IN TRAWLER FLEET

If fleet-expansion plans of Ranger Fishing Co. of North Shields are approved by the White Fish Authority (WFA), a Lowestoft shipyard will get the most valuable single order yet placed by a British trawler owner--about US$7,680,000 for four 215-ft.-long factory stern trawlers.

The firm already has 3 factory trawlers. It has been considering an increase. WFA approval is necessary to get the 35% building grant. In this case, it would amount to more than $2,400,000. This probably would be spread over the 2- to 3-year building period.

The Ranger Fleet

The 3 vessels in the Ranger fleet were built in 1965 and 1966. They are small factory trawlers 171 ft. long with a fish hold capacity of 13,000 cu. ft. In the 3½ years since they first entered service, the firm has accumulated considerable experience. Its dock has been modernized. It has put up a cold store able to hold 800 metric tons of fish landed in fillet packs ready for distribution to fish friers.

Factory Trawler Operations

While the trend in other large British trawler ports has been towards the whole fish freezer, North Shields now seems destined to become the base of an efficient factory trawler operation. This includes a

United Kingdom (Contd.):

Ranger Training Center at the fish quay, where recruits are given instruction in specialized work aboard the factoryship. ('Fishing News,' May 23.)

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SCOTTISH BOARD HAS INVESTED US$3.6 MILLION IN FISHERIES

The Scottish Highlands and Islands Development Board reports that it had invested US$3.6 million in the fishing industry since Nov. 1965; $485,854 in grants; $3,083,926 in loans, and $48,000 in equity participation. The investment has provided 850 jobs, half sea-going.

About $1,965,600 directly assisted vessel purchase; the remainder went to shore-based projects.

Board's Report

The Board assisted catching, ancillary trades, processing, and fish farming.

Of the 24 new vessels approved--19 for the Western Isles fleet--15 had been launched and were fishing; 5 were under construction. Sixty-two fully experienced fishermen had been helped to buy secondhand boats. Although these have a shorter working life, they created jobs at a lower overall cost than most other assistance.

The Board helped purchase 10 new 16-ft. seaweed boats. Their yield raised productivity of the 3 processing factories in the Western Isles by an estimated 15%.

The Board approved building 20 "dual purpose vessels"--lightly built boats up to 35 ft. which can be used for creel-fishing, tourist trips, sea-angling, or short-distance ferrying. Seven of these had gone to Caithness County because of the great interest in sea-angling there.

Ancillary Trades

Before the Board adopted its various schemes, the boatyards had been limited basically to their local markets. The problems of transport, cost, and basic communications had worked against expansion. Now the market extends to all 7 crofting counties. The $336,000 invested provided 99 jobs.

Thirty vessels, 28 under 35 ft., had been built, or were on order. Help to other ancillary industries totaling about $117,600 involved 38 jobs, including marine engineering and ice-making. ('Fishing News,' May 23.)

Norway

STATE SUPPORT FOR FISHERIES IS INCREASED

Increased state support to the Norwegian fisheries for June 1, 1969, through May 31, 1970, has been approved unanimously by the Storting (Parliament). As in previous years, the bill was based on negotiations between the Norwegian Fishermen's Union and the Ministry of Fisheries. State subsidization of fisheries is estimated at US$35.7 million for the year ending May 31, 1970. This does not include the extraordinary support measures for the stockfish industry previously adopted.

1969/70 Aid High

The 1969/70 fisheries subsidies are US$3.5 million higher than those originally voted for 1968/69. However, including aid to the stockfish industry (US$4.2 million), fishery payments were officially estimated at US$36.4 million in 1968/69.

Other Aid

The Storting also approved a US$2.8 million loan arrangement for owners of fishing vessels hit hard by failures in major fisheries in 1968/69. A similar arrangement of US$1.4 million was voted for herring curers affected by the complete failure of this year's winter herring fishery. (U.S. Embassy, Oslo, July 1.)

* * *

USES MORE SEA WEED

A new factory using sea weeds as raw material is operating near Haugesund in southern Norway. Owned by Protan & Fagertun, it will produce 1,000 metric tons of alginate a year. Using its older factory and the new one, the firm now can produce 15% of world's need for alginate. It is the world's largest company of its kind.

Norway (Contd.):

The Firm's Operation

The firm has a new experimental trawler and 8-10 other vessels gathering sea weeds for alginate production. It employs 300 persons; 1,500 other persons gather sea weeds.

As much as 95% of production is exported. The textile industry is one of the largest buyers of alginate. It uses the product to thicken and print textiles with special colors. The food industry, another important buyer, uses it as an ingredient in jelly, instant desserts, and ice cream. The paper industry, a major customer, uses it in surface treatment of paper and cardboard.

Exports to developing nations are increasing. Eastern Europe also is becoming a large customer. The company is working to increase sales to the U.S. ('News of Norway,' June 23.)

* * *

POLAR COD FISHERY DEVELOPS

Norway is rapidly developing a new industrial fishery for polar cod in Arctic Ocean. These fish are suitable for meal and oil--not human use. So far, 20 to 30 boats have caught 2,325-2,790 metric tons. Biggest single catch was 558 metric tons. ('News of Norway,' June 23.)

* * *

FROZEN FISH EXPORTS TO U.S. RISE

Norwegian exports of frozen-fish products to the U.S. are expected to be 25,000 to 30,000 metric tons this year. Annual exports before 1967 were about 7,000 tons.

Partly responsible is Nordic Group, a combination of 21 companies in the frozen fish business. In its first year of operation, it has exported 8,000 tons.

Total Nordic Group exports for 1969 are expected to be 12,000 tons, nearly half national total. A large part of export products, such as "haddock fillets," had not been produced in Norway. ('News of Norway,' June 23.)

Denmark

INDUSTRIAL FISH LANDINGS DOWN IN EARLY 1969

Unusually poor weather caused a considerable drop in industrial fish landings in early 1969. In 1968, the fishery had started on January 2, but this year it did not begin until April. Landings in first 4 months were 194,000 metric tons, a drop of 68,000 tons from the 262,000 landed in same period 1968. Even if the remainder of the year should prove unusually profitable, the loss can not be made up. The largest decrease was in April, when catch reached only about 35,000 tons. It had been 77,000 tons in April 1968.

Fish Meal & Oil

Fish meal and oil production dropped markedly as a result of the light landings. Exports of herring meal were 62,500 tons worth US$890,000 in first 5 months 1968. ('Børsen,' July 15.)

Greenland

HER FIRST MODERN TRAWLER WILL TRAIN LOCAL FISHERMEN

Greenland's first modern trawler 'Nuk' will help Eskimos become up-to-date fishermen. Nuk, registered in Godthaab, will be a training vessel. Initially, she will be manned by Faroese who will teach the Eskimos to operate her.

Cost and Construction

The vessel cost about US$1.2 million, including US$360,000 for equipment. She is 164 ft. long, 31 ft. wide; depth to main deck is 15 ft., deadweight 433 gross tons, and speed 15-16 knots. Constructed as a shelter decker with elongated afterend, she is equipped with trap nets and floating trawl. Before she sailed to Greenland, tests were made with the 'net-sonde' equipped trawl.

Processing Equipment

The 300-cubic meter storage compartment below is insulated. The work deck has 9 hydraulic movable bleeding tanks, gutting

Greenland (Contd.):

tables, cutting and gutting machines, washers, and cold-storage equipment. Conveyor belts connect the bleeding tanks to the storage room. The fish hatches and stern gate move hydraulically. Final processing will take place at land-based plants.

Operating Plans

The vessel will operate primarily on fishing grounds off Greenland's west coast, making relatively short trips. Depending on the success of the experiments and training, other Nuk-type trawlers may be constructed. ('Fiskaren,' May 5.)

Iceland

PROMINENT ICELANDERS VISIT U.S.

The Icelandic Freezing Plants Corp., one of the country's major fish-exporting firms, organized a visit to the U.S. in late Sept. for about 90 persons. The trip marked the 25th anniversary of the Coldwater Seafood Corp. of Scarsdale, N.Y., and Cambridge, Md., the U.S. affiliate.

Prominent Visitors

Participants included officials of the Ministry of Fisheries and its Economic Institute; journalists; representatives of the Central Bank and 2 principal commercial banks; and directors of the 60 fish-processing plants that are corporation members. (U.S. Embassy, Reykjavik, July 24.)

West Germany

TRADE MINISTER OUTLINES FISHERY POLICIES

The West German Minister of Trade has issued this summary of his nation's fishery policy and its concern with the proposed European Communities (EC) fishery policy:

"West Germany's Common Market partners are today already large purchasers of German fisheries products and the trade within the EC will expand even more as the remaining barriers are removed. At the present time, we can not foresee the effects of the planned market organization for fisheries products. The Federal Government is skeptical toward the EC Commission's proposals with respect to a common fisheries policy because such proposals would imply a centrally directed structural policy and a complicated system for protection of prices based on public funds. The proposals are to a considerable degree based on already existing market arrangements--far from having been successful in all aspects--and therefore are subject to an extensive revision. Before conclusive evidence of such a revision is reached, we cannot determine any new market arrangements."

Wants Simple System

"The Federal Government advocates a simple and liberal system which should be limited to the most important fish species. We must consider the Regional differences in the fishery of the Atlantic Ocean, the Mediterranean, and the coastal waters of the Associated African states. The responsibility of the fishing industry must be based on efforts to stabilize the market as well as the prices. Therefore, establishment of producer organizations should be encouraged. The Federal Government is a definite adversary to public intervention efforts in the fisheries sector because such efforts after experiences with market support under the German fisheries law lead to a large-scale fishery without consideration to demand."

Recommends Coordinated Efforts

"Of particular importance for a well arranged and outlined marketing place for fisheries products is unity in quality norms, packaging, sorting, etc. Because EC is in need of fisheries products, the aim should be toward achieving liberal arrangements in relation to their countries. While negotiations take place with the most important supplier countries, EC should stabilize unity arrangements of the reference price system, for example like those which have been practiced successfully in the herring trade between Denmark and the Federal Republic. In principal, the structural policy should be the private matter of each member country within a certain frame so that distortions in

West Germany (Contd.):

competition may be avoided. Through closer cooperation, the possibilities of creating more effective fisheries protection and research work will be greater. A coordination of efforts from each member country would strengthen the EC's economic and political importance in international unity. Aside from some unavoidable transitional difficulties, the Common Market would generally offer advantages to the German fishing industry."

Optimistic About Future

In conclusion, the Minister of Trade said the German fishing industry is adjusting to changed conditions. He is encouraged by its knowledge and willingness to face future problems. "In view of the fishing industry's position to the problems, I find it easy to recommend assistance supplementary to one's own efforts." ('Fiskets Gang,' May 8.)

France

THEY ARE EATING MORE FRESH FISH

Frenchmen are the most voracious fresh-fish eaters in the European Community (EC), according to the Community's statistical office.

In 1967, Frenchmen averaged 33.9 pounds of fresh fish, compared with 27.1 pounds in Belgium, 25.1 pounds in Italy, and 21.8 pounds in Germany and the Netherlands. In 1967 the Community averaged 26.7 pounds per person, compared with 23.8 pounds in 1960.

1967 EC Landings Down

In 1967, landings of fish by Community fleets were slightly lower than in 1966. This resulted largely from a 10% decline in herring catches.

This decrease was offset partially by an 11,000-ton rise in German cod catches which were 80,000 tons in 1967. ('European Community,' July.)

USSR

BLAMES JAPANESE FOR DEPLETING PACIFIC HERRING & FLOUNDER

Herring and flounder stocks off Soviet Far-Eastern shores--traditional grounds off Kamchatka and Sakhalin--are in jeopardy because of intensive, uncontrolled Japanese fishery for immature herring and groundfish. This was stated bluntly by the official organ of the Soviet Fisheries Ministry, 'Rybnoe Khoziaistvo,' No. 6, 1969.

The situation has become so grave that people whose livelihood depends on these species face serious economic consequences unless drastic measures are taken to save the resources.

Soviet Suggestion

The Soviets suggest these steps as a minimum remedy: 1) Stop 1969 fishery for immature herring in Shelikhov Bay (Okhotsk Sea, west of Kamchatka) north of line from Cape Utkolokskii to Cape Tolstoy; stop this fishery in Karaginskii Bay (Bering Sea, east of Kamchatka) north of line from Cape Oliutorksii to Cape Ozernyi. 2) Discontinue flounder and other groundfish fishery off western Kamchatka--between 53° and 58° N. lat. at depths less than 100 fathoms in winter, and less than 50 fathoms in other seasons.

Unilateral Soviet measures restricting their herring and flounder fisheries are no longer sufficient to save resource; Japanese cooperation is imperative.

Another Soviet Complaint

The Soviets also complain about preemption of the fishing grounds: 70 Japanese vessels in Shelikhov Bay had gill nets extending over 60 miles in May-June 1967; over 140 Japanese vessels in May 1968 had nets extending over 250 miles in Korf and Anapka Bays.

* * *

SCIENTISTS PESSIMISTIC ABOUT FUTURE OF NORTH SEA HERRING STOCKS

Scientists of the Soviet All-Union and Atlantic Fisheries and Oceanography Research Institutes (VNIRO and ATLANTNIRO) warn that prospects for the North Sea herring fishery are "bleak" unless--(1) the immature

herring fishery is discontinued; (2) the fishery for maturing herring is strictly controlled; and (3) bottom trawling for mature herring on spawning grounds during larvae and fry reproduction and growth is reduced or stopped.

Soviets Say Stock Overfished

The Soviets say the stock is overfished. Any increase in effort will have negative effect on quality, quantity, and biology of North Sea herring populations.

The Soviets blame the 1964-66 expansion of Norwegian purse seining for depleting the maturing herring of the 1963 year-class. The harvestable 1960-class that replenished stocks in 1963-64 declined considerably in 1966-67; the abundant 1963 year-class fished intensely in 1964-66 lost commercial value by 1967-68. This is reflected in North Sea herring catches, which increased from 932,000 metric tons in 1963 to over 1.4 million tons in 1965; the catches dropped to 706,000 tons in 1968.

Soviet catch data are exclusive of Blødden Bank, where the West Germans and Danes annually take 100,000 tons of immature herring.

Further declines in North Sea herring fishery must be expected. ('Rybnoe Khoziaistvo,' No. 5, 1969.)

* * *

GRAPPLES WITH WATER POLLUTION PROBLEMS

A Soviet official writing in 'Izvestiia' on July 7 called public attention to water-pollution problems caused by industrial waste. He decried uncontrolled dumping of waste that endangers fresh-water supplies and produces "irreversible" biological changes in fresh-water and marine life.

Exortations, even legal regulations prescribing use of water per unit of factory output, are being ignored, the official said.

Proposes Water Tax

He suggested the solution would be to end "free water" and begin to tax industrial enterprises for the use of water. He proposed "differentiated taxes." Plant managers would be forced to speed construction of water-purification facilities. Price of water would vary from region to region and depend on availability and demand for water.

Suggests New Control Agency

Finally, the author calls for formation of a new ministry-level agency to deal with pollution problems.

One major beneficiary of any new regulations would be Ministry of Fisheries. For years, it has led the fight against waste-discharging enterprises on river shores and coasts of Caspian and Black Seas.

Purification Expensive

Research and planning groups are concentrating on introducing new techniques for water purification. Building costs of waste-processing facilities are extremely high--sometimes 30% of original construction cost of a plant. Costs run as high as 31 to 36 U.S. cents per cubic meter of waste water.

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OIL-OXIDIZING BACTERIA FOUND IN WATER POLLUTION RESEARCH

The Ukrainian Academy of Sciences Institute of Hydrobiology at Kiev has published a paper on microbial oxidation of oil products in the Danube. Soviet scientists isolated and identified cultures of oil-oxidizing bacteria (machine and various mineral oils); most were genus Pseudomonas. The distribution and oxidizing properties of 26 species were studied. The capability of some species to oxidize hydrocarbon compounds of oil was found for the first time. ('Gidrobiologichekii Zhurnal,' Vol. 5 (No. 3) March.)

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USSR (Contd.):

KRILL PASTE IS SUCCESSFUL ON MOSCOW MARKETS

The All-Union Fisheries and Oceanographic Research Institute (VNIRO) has developed a commercial paste from Antarctic krill "rich in proteins, vitamins, and minerals." The paste, under the brand name "Okean," is selling well in Moscow. It has a pleasant taste and aroma, somewhat like shrimp.

According to VNIRO, the paste has this chemical composition: moisture 65-75%; fats 3-10%; nitrous substances 15-20%; carbohydrates 2%; ash 1.5-3.0%. It also contains potassium, iron, manganese, zinc, etc. Analysis by VNIRO's Laboratory of Fisheries Technology reveals that krill is high in essential amino acids like arginine (9.1%), lysine (12.8%), leucine (16%), and phenylalanine (6.8%).

Fishing & Processing Developments

Other Soviet sources report that Antarctic krill stocks are "practically unlimited". VNIRO is developing a "special trawl for krill fishing"--and a mechanized processing line to produce a semiprocessed krill product with 50% protein content.

Promotion

'Rybnoe Khoziaistvo,' No. 5, 1969 (official organ of the Soviet Fisheries Ministry) carries a full-page ad recommending use of krill paste in sauces, cheese spreads, and hot dishes. The Ministry also recently mixed krill paste with cheese (10% krill, 90% cheese) and claims the product is selling rapidly in Moscow food stores. Its brand name is "Korall."

* * *

FISHING FLEETS NOW BASED ON CANARY ISLANDS

Spain has agreed to allow Soviet fishing fleets in the Southern Atlantic to base at the port of Santa Cruz de Tenerife in the Canary Islands. A 'Manchester Guardian' correspondent reported from Madrid that details were worked out early this year, but revealed only in early August. At that time, a Soviet delegation at Santa Cruz signed the contract to use the port's facilities.

Equality With Japanese

The agreement will put the Soviets on equal footing with the Japanese, who have operated about 100 fishing vessels for several years. It has been estimated that over 200 Soviet fishing and support vessels are in the southeastern Atlantic. ('Washington Post,' Aug. 11.)

The official Spanish news agency CIFRA announced "semiofficially" that the Soviets were scheduled to begin using Santa Cruz before the end of August.

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EXPORTS HERRING TO JAPAN

Negotiations to import Soviet herring were concluded in early April by the 11-company Japanese Corporation for Import of Soviet Herring and DALINTORG (Soviet Far Eastern Trade Office).

The USSR will export 7,000 metric tons of fresh and frozen herring to Japan in 1969. In return, she will import fishing gear, fish finders, work clothes, fruits, and household materials. It was the largest transaction for this type of trade made by the two countries.

Prices

According to the Federation of Hokkaido Fisheries Cooperative Association, the import price for 4,000 tons of fresh herring was set at US$125 a metric ton, or $3 above the 1968 price. The fish are to be received by Japanese carrier from Soviet vessels on the fishing grounds. Frozen herring (3,000 tons) will be delivered to Wakkanai at $220 per ton, or 25 dollars above the 1968 price. Total 1969 imports would be 2,500 tons above 1968's.

Alaska Herring

The herring import quota is 8,000 tons for this year. To fill the balance, Mitsubishi Shoji began negotiations to import 1,000 tons of frozen herring from Alaska. The 1,000 tons at $200-210 a ton were scheduled to be imported into Japan by the end of May or early June. ('Minato Shimbun,' Apr. 8.)

LATIN AMERICA

Cuba

REPORT ON FISHING INDUSTRY TRENDS

During the 1969 Spring Fair at Leipzig, East Germany, the correspondent of the British 'Fishing News International' interviewed the Cuban delegation.

Some interview highlights:

(1) Cuba and East Germany seem bent on increasing cooperation to develop the Cuban industry. E. Germany may possibly replace some Soviet fishery aid Cuba has received over the past 9 years;

(2) Cuban shrimp fishing will be concentrated in offshore waters, off Guyanas, and in Gulf of Mexico;

(3) Fishing vessels delivered to Cuba by E. German shipyards will be paid for by Cuban fishery exports (E. Germans especially want tuna);

(4) Processing and freezing capacity of Cuban industry has quadrupled in past few years;

(5) A School of Fishing to provide pupils and apprentices for expanding fleets has been organized. Over 5,000 pupils with elementary education are attending classes. A new Fisheries College trains captains, navigators, engineers, technologists, and electronics specialists;

(6) Cuba is assisting Guinea. It is running a training school at Conakry. Cuba also plans to aid fishing industries of developing countries in Central and South America, but details were not disclosed.

Buying Vessels

In July 1969, the Cuban high-seas fleet had 143 vessels: about 30 were fishing tuna; 90 were new shrimp trawlers bought from Spain. On order are 5 stern freezer trawlers and 15 'fish meal cutters' from E. Germany, 30 shrimp vessels from France, and a few vessels from Spain.

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SALTED COD INDUSTRY DEVELOPS

Dried and salted cod, a traditional dish in Cuba, is an important factor in supplying the protein needs of the people. Heretofore, cod was imported, but now Cuba is developing her own fisheries and establishing her own salting industry.

FAO Aid

The government of Cuba has asked for FAO assistance to improve all areas of cod production--catching, preparation and salting, and product distribution. Salted cod is produced primarily for domestic consumption; other Cuban fisheries cater to the export market.

Production

Annual capacity of existing salted cod plants in Cuba is about 5,000 metric tons; most is produced by one plant in Havana. With a new plant under construction in Antilla, it is hoped that production will reach 20,000 metric tons. The new plant production will equal current imports. ('Industrias Pesqueras,' Apr. 15.)

Chile

FISH-MEAL PRODUCTION DECLINED IN JAN.-APR.

North Chile's anchovy catch and fish-meal production continued to decline from January through April. This followed the trend of the previous 2 years.

For the first 4 months of 1969, the 4 plants in Arica averaged 15 working days per month; the 9 Iquique plants 16 days per month; and Antofagasta averaged 10, 17, and 22 working days per month.

Protein content of anchovy meal averaged 65%. Prices c. & f. per metric ton were: US\$132-146 in January; US\$142-145 in February; US\$130-140 in March; and US\$110-132 in April. (Instituto de Fomento Pesquero, Informe Mensual Nos. 2, 3, 4, 1969.)

ASIA

Japan

1970 FISHERY BUDGET WILL BE LARGER

The Japanese Fisheries Agency prepared a budget asking for about US$138.9 million for fiscal year 1970 (Apr. 1970-Mar. 1971. This was over $44 million more than the $94 million budgeted for FY 1969. The budget request was scheduled to be submitted to the Finance Ministry in early September.

1970 Budget Items

Important items in the 1970 budget and funds requested are: (1) vessel construction and remodelling, $2.4 million; (2) a new program of cultivating deep-sea fishery resources--salmon, tuna, crab and euphausid--$342,000; (3) fishing ground development: $892,000 for operating 2 purse seiners in northwest Pacific and off New Zealand, $212,400 subsidy for saury survey in Pacific east of 180° long., $181,400 for tuna research, and $878,400 for 2 trawl explorations off New Zealand and in northeast Atlantic; and (4) fishery imports countermeasure, $16,100. This would establish an import system to cope with impending liberalization of fishery imports. ('Shin Suisan Shimbun,' July 28.)

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NEW DISTANT-WATER GROUNDS MAY HELP DEPRESSED SAURY FISHERY

The Japanese coastal saury fishermen, who could not make money when catches were very good, are now poor because they can't catch enough fish. Saury landings peaked in 1958 with 575,000 metric tons. Later, landings started to decline and, in 1968, slumped to a record low of 130,000 tons.

Cause of Decline Unknown

The fall-off is attributed by some to heavy Soviet fishing off Japan, but Fisheries Agency data show the Soviet catch also has not been good. Despite continued investigations of coastal saury resources, the cause of decline is unknown. Saury fishermen fear there is no hope for recovery.

Tokyo Aids Fishery

In April 1969, to help the depressed fishery, the Fisheries Agency launched a US$50,000 resource survey program to develop new grounds. Six survey cruises were scheduled in offshore waters. However, the industry feels the effort is inadequate. It wants to conduct a separate survey over a much wider Pacific area with major fishery firms. Some large firms have offered to cooperate.

Firms Seek New Grounds

Meanwhile, some leading firms are seeking to develop new grounds in the eastern Pacific. Nihon Suisan has plans to conduct saury fishing in the eastern Pacific and is optimistic about distant-water operations. If downward catch trend continues, the firm believes, the price would remain sufficiently high.

For example, medium saury of 50-60 count per 7.5-kilogram (16.5-pound) box would bring $2.78-3.33 on food-fish market; catches of 130-140 count per 10-kilogram (22-pound) box could be sold for $4.16-5.56 as bait fish.

If Nihon Suisan's expedition develops new grounds for enough home-based vessels, it will help stabilize Japanese saury fleets.

Quantity & Value of Japanese Saury Catch, 1958-68

Year	Catch	Value
	Metric Tons	US$1,000
1968	130,200	18,286
1967	220,087	29,450
1966	241,840	29,008
1965	231,377	26,589
1964	210,689	17,575
1963	384,548	30,919
1962	483,160	18,356
1961	473,792	28,728
1960	287,071	27,908
1959	522,567	27,578
1958	575,087	19,381

Source: 1958-67--Ministry of Agriculture and Forestry Statistics; 1968--Japan Saury Association.

Experimental Fishing Planned

Nihon Suisan applied to Fisheries Agency for a permit to fish experimentally for saury with stick-held dip nets in eastern Pacific from early July 1969. The 538-gross-ton

Japan (Contd.):

trawler 'Shinano Maru' and the 84-ton saury vessel 'Koshu Maru No. 8' would spend $1\frac{1}{2}$ months in area extending southeast from Aleutian Islands to southern coast of California. (One trade journal reported the vessels would fish from July until Dec. with target of 280 tons.)

The Agency reportedly intended to license the operation. The saury fishing industry indicated it would support the venture if it would not affect adversely the coastal saury fishermen and would develop new grounds for them. Nihon Suisan has agreed to make all data available to the industry and to take aboard a representative.

Nichiro Interested

Nichiro Fishing Co. also informed the Agency of its desire to explore saury resources in eastern Pacific. It is considering using three 500-ton trawlers. ('Suisan Shuho,' June 15, and 'Suisancho Nippo,' June 19 & 20.)

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SALMON MOTHERSHIPS
REACH 1969 QUOTA

The 11 Japanese salmon motherships in Area A (north of 45° N. lat.) of the North Pacific attained their 1969 fleet target of 44,000 metric tons in late Aug. By end of Aug., all fleets had returned to Japan.

By species, the fleet catches averaged 30% reds, 30% chums, 30% pinks, and 10% silvers and kings.

Compared with 1967

Compared with the previous good pink salmon year of 1967, pink salmon catches were up, but red salmon landings were down sharply. In 1967, the fleet catches averaged 46% reds, 32% chums, 20% pinks, and 2% silvers and kings.

The 1969 high-seas salmon fishery was hampered by stormy weather and wide dispersion of fish because of cold-water masses. ('Suisan Keizai Shimbun,' Aug. 7.)

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CANNED RED SALMON
EXPORT PRICES RISE

On Aug. 1, 1969, the Japan Canned Salmon and Crab Sales Co. adopted new export prices for fancy-grade canned red salmon to the United Kingdom.

The new prices (c.i.f. plus commission) are: US$24.20 a case for 48 $\frac{1}{2}$-pound cans, and $13.30 a case for 48 $\frac{1}{4}$-pound cans. They are about $5.60 and $1.00 a case above 1968 prices and new highs.

Why Increase Adopted

The increase was adopted for 2 reasons: 1) to make up for unreasonably low export prices set in 1968; 2) to cope with reduced canned red salmon production by motherships. Their catches this year were largely frozen because of strong domestic demand. ('Suisan Keizai Shimbun,' Aug. 5.)

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CANNED WHITE TUNA
STOCKS EXHAUSTED, PRICES RISE

The Tokyo Canned Tuna Sales Co. had sold all its canned white meat tuna by mid-June as a result of heavy buying by major firms. Since the new business year began April 1969, the Sales Co. received from packers canned white-meat tuna consignments of about one million cases. About 600,000 cases were sold during April, May, and early June; the remaining 400,000 cases were sold in mid-June in one week. Canned light-meat tuna stocks dropped to several thousand cases.

Why Sudden Mass Buying?

On June 24, the Sales Co. directors met to assess situation and to develop countermeasures. They stopped sales of future consignments temporarily until a sufficient supply could be accumulated. Then they would renew selling price and method of sales. General opinion is that trading firms, noting unpromising summer albacore fishery, feared possible shortage and bought early to meet sales targets.

Some Higher Prices

On June 3, 1969, the Sales Co. increased prices for two can sizes of canned white meat

Japan (Contd.):

tuna packed in brine: US$0.28 for $66\frac{1}{2}$-oz. 6's; $0.50 for 6.6-lb. 6's; and $0.45 for chunk white meat tuna in 6.6-lb. 6's. The new prices, exwarehouse Shimizu, are:

Tuna in Brine	$/Case Exwarehouse
White meat solid, $66\frac{1}{2}$-oz. 6's	12.34
White meat solid, 6.6-lb. 6's	21.17
White meat chunk, 6.6-lb. 6's	18.94

('Suisancho Nippo,' and 'Suisan Tsushin,' June 27.)

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CANNED FISH EXPORTS TO WEST GERMANY INCREASE

In 1968, Japanese canned-fish exports to West Germany totaled 13,679 metric tons worth about US$10.9 million. This was an increase of 2,126 tons and $1.6 million over 1967, and 2,257 tons and $1.86 million over 1966.

Canned Tuna & Mackerel

Canned tuna exports to West Germany in 1968 were 94% of her total value of canned-tuna imports. This compared with 91% in 1967 and 83% in 1966. Canned-mackerel exports to West Germany in 1967 and 1968 (none exported in 1966) were 65% of the value of her imports of that product. ('Suisan Tsushin,' July 26.)

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TO SURVEY U.S. CANNED TUNA INDUSTRY

The Japan External Trade Organization, a government agency, is scheduled to survey the U.S. canned tuna industry in fiscal year 1969 (April 1969-March 1970). Major tuna packers in Terminal Island, Calif., and in Puerto Rico will be selected to gain better knowledge of the competitive power of U.S. canned tuna.

The survey will include case studies: (1) plant history, (2) importance to company of tuna-packing plant and its products, (3) source of its major raw materials, (4) manufacture of byproducts and development of new products, (5) cost study, and (6) sales network. ('Nihon Suisan Shimbun,' June 18.)

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CONTRACTS TO BUY SHRIMP FROM CUBA

The Taiyo Fishing Co. recently concluded a long-term shrimp-purchase contract with Cuba. Reportedly it already has taken delivery of 600 metric tons worth about US$500,000. The contract provides for purchase of 1,000-2,000 tons of Cuban shrimp and miscellaneous fish through a triangular trade involving a British agent.

Taiyo's Part

In return, Taiyo will export to Cuba fishing vessels and gear, port machinery, canning plants, and shrimp culture equipment; also, it will provide technical assistance.

Cuba is promoting her fisheries. The shrimp contract is said to be aimed primarily at obtaining technical assistance for their development. ('Suisancho Nippo,' July 30.)

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RESOURCE SURVEYS PLANNED IN 6 COUNTRIES

To promote expansion of distant-water fisheries, the Japan Fisheries Association plans to send resource survey teams to 6 countries during fiscal year 1969 (Apr. 1969-Mar. 1970). Total cost is almost US$144,900; the government is expected to contribute half.

The Surveys

The 6 countries are: Indonesia, New Guinea (Papua), New Zealand, Spanish Sahara, Mauritania, and Chile. ('Suisan Tsushin,' July 29.)

Thailand

BEGINS LARGE-SCALE CARP BREEDING

Large-scale induced breeding of Chinese carp is beginning in Thailand. Several government fisheries stations, the University of Agriculture, and 3 private hatcheries have adopted the technique; about 1,500,000 fry have been produced in 1969. As a result, the market price of fry has dropped about 75%.

Thailand (Contd.):

Catfish Fry

The Bung Borapet and Chiengmai Fisheries Stations continue induced breeding of "Pangasius"--a large catfish greatly appreciated as food fish--and produced about 200,000 fry. Chiengmai Station also breeds "Puntius gonionotus," a variety of carp; it produced about 500,000 fry. ('FAO Fish Culture Bulletin,' vol. 1, no. 3, Apr. 1969.)

South Vietnam

OFFSHORE FISHERY TO BE DEVELOPED

An Offshore Fishery Development Project is now underway in South Vietnam. It is administered by the Food and Agriculture Organization of the United Nations (FAO) under the United Nations Development Program (UNDP). Total funding is US$4.2 million--the U.S. contributes $2 million, the Netherlands $220,000, South Vietnam about $833,000, and about $1 million comes from the UNDP Special Fund.

Purposes

The project is to last 3 to 4 years. Its purposes are: (a) to conduct exploratory deep-sea fishing, mainly trawling for demersal--snappers, cuttlefish, shrimp, etc.--and pelagic species--tuna, mackerel, sardines, etc.; (b) to conduct exploratory coastal trawling and purse seining; (c) to study the commercial feasibility of introducing modern craft and fishing methods to exploit newly found resources; (d) to study current marketing problems, and assess prospects for marketing increased landings, and (e) to train Vietnamese fisheries staff and fishermen.

Survey Areas

A survey area has been designated in the South China Sea within the limits of South Vietnam's Continental Shelf. It has been divided into 3 sections, each corresponding to a phase of the project. Phase 1 includes the area east and south of the Mekong Delta between 105° and 110° E. long., and 5° and 10° N. lat. This area has been divided into 105 grids, with 4 stations in each grid. Phase 2 involves the area south and west of the Mekong Delta in the Gulf of Siam. Phase 3 extends north of the phase 1 area along the east coast. At the stations, the vessels trawl, take depth soundings, measure water temperature, salinity, etc.

Project Vessels

The project requires 2 vessels. One will be needed for 3 years, another for 2, and a third for 1 year. The first is the 'Kyoshin Maru,' a 300-ton stern trawler chartered from the Japanese firm Kyokuyo Hogei. She arrived in December 1968 and operates out of Singapore because the Japanese Seamen's Union insisted that a non-Vietnamese port be selected as her operating base. The 'Hau Nghi,' a 120-ton trawler contributed by the Netherlands, arrived at Singapore in May. She, too, is based in Singapore. Upon completion of the project she will be donated to South Vietnam. The third vessel, considerably smaller than the first two, will be used for purse seining during phase 3. Phase 3 is scheduled to begin by January 1971.

Cruises Underway

Kyoshin Maru has completed 6 of 12 planned cruises in the first of the 3 survey areas. Her initial findings are very encouraging: several commercially important fishing grounds have been discovered. Even at this stage, studies seem to indicate both the economic and technical feasibility of developing South Vietnam's fishing industry to the point of doubling the yearly fisheries catch. It is now 400,000 metric tons. The training of South Vietnamese fishermen, fishery administrators, and specialists, however, is running behind schedule because of the general mobilization. (U.S. Embassy, Saigon, Aug. 5.)

South Korea

MARINE CATCH ROSE OVER 11% IN 1968

South Korea's 1968 marine fisheries catch was 852,291 metric tons, 13.6% more than the 750,349 tons caught in 1967. In reporting these data, the Central Association of Fishery Cooperatives noted that Korea's marine catch growth rate has averaged 13.5% a year since 1962. ('Suisan Keizai,' April 24.)

Planned 1968 fisheries production, including fish culture, was 859,000 tons. Fish culture was to contribute 93,000 tons, or 11%. Actual marine catch in 1968 exceeded planned by 86,000 tons--more than 11.2%.

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S. KOREA TO SEND SURVEY TEAM TO NEW GUINEA

S. Korea plans to send a 3-man survey team to Papua, New Guinea, in Oct. 1969 for one month. The survey follows agreement on fishery cooperation between S. Korea and Australia during Korean President Park's visit to Australia in Sept. 1968.

Survey Objectives

The team will gather data on New Guinea's fisheries, production facilities, marketing and distribution systems to plan for cooperation between the 2 countries.

Speculation in Japan, also planning to send a team to Papua, is that S. Korea may be planning to form a joint venture with Australian interests. ('Katsuo-maguro Tsushin,' July 29.)

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DEEP-SEA FLEET IS EXPANDING RAPIDLY

The Republic of Korea's deep-sea fishing fleet has one of the fastest growth rates in the world. Between January 31 and July 1, 1969, the fleet increased by 19 units (16,926 gross tons) to 209 vessels (63,000)--a 36.5% increase.

Shing Hung Co. Joins Fleet

The largest increase, both vessels and tonnage, resulted from the entry of Shin Hung Fisheries Co. into the North Pacific with 17 vessels (13,560 gross tons). Not all were new; 11 had been fishing shrimp off Indonesia unprofitably. Five new fishing vessels, and a new processing vessel, were bought from Japanese shipyards. The new vessels began fishing Alaska pollock in the Bering Sea in early June. Five gillnetters engaged in a short-lived salmon fishery in Bristol Bay.

Other Companies Active

Dae Lim Fishery Co., a second newcomer in the high-seas fishery, based one 820-gross-ton trawler at Las Palmas, the Canary Islands.

The Korea Deep-Seas Fisheries Co. expanded more than any other of the 18 South Korean companies already deep-sea fishing on January 31; it added 5 vessels and 1,762 tons.

Demersal (Bottom) Trawling

Demersal trawling, insignificant in January, had expanded eightfold by July. In January 1969, the government-sponsored Korea Marine Industry Development Corp. (KMIDC) was fishing bottom-living species with 2 trawlers (2,000 gross tons) based at Las Palmas. By July, 23 vessels (17,594 gross tons) were bottom fishing. Operating from Pusan, Shing Hung and KMIDC fished Alaska pollock in the North Pacific, and KMIDC and Dae Lim trawled from Las Palmas.

Tuna Fleet

The number of tuna vessels remained about the same--187 in January and 186 in July--but gross tonnage increased from 44,315 tons to 45,702. The Korean tuna fleet ranges the world. Thirteen overseas tuna fleet bases were operational in July: American Samoa (about 70 vessels); Fiji Islands (18); New Hebrides (7); Freetown, Sierra Leone (21); Cape Verde Islands (11); Tema, Ghana (4); San Martin, West Indies (4); Abidjan, Ivory Coast (3); Las Palmas (10); Durban, South Africa (20); Tematave, Malagasy (9); Penang, Malaysia (6); and Fortaleza, Brazil (3).

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PICTORIAL REPORT ON KOREAN FISHING & SUPPORT VESSELS OFF ALASKA

William R. Dickinson

Since 1966, when the Republic of Korea (S. Korea) sent its first exploratory fishing vessel through the Aleutians and the Gulf of Alaska, operations have increased each year. In 1969, her activities off Alaska have involved 2 large independent stern trawlers, 2 smaller fleet stern trawlers, 7 side trawlers, 5 gill-netters, two 1,000-ton refrigerated support ships, a 350-ton support ship, and a 7,000-ton factory ship. The 4 stern trawlers are of French manufacture. The large factory ship is an ex-Norwegian unit. The rest of the fleet is Japanese built.

Sought Groundfish Before 1969

Prior fishing efforts had been for ground fish, primarily Alaska pollock (Theragra chalcogrammus) and yellowfin sole (Limanda aspera). In 1969, however, 5 gillnetters worked the approaches of Bristol Bay during the height of the salmon run.

The 1969 fishery was conducted with larger and more efficient ships than the 1967 and 1968 expeditions and, for the first time, appeared economically successful.

Fig. 1 - The 'Kook Yang No. 115' hauling a salmon gillnet in outer Bristol Bay between Port Moller and St. Paul Island. The South Korean salmon boats fishing here in 1969 were in excellent concentrations of red salmon.

Mr. Dickinson is Fisheries Management Agent, BCF, Office of Enforcement and Surveillance, Kodiak, Alaska.

Fig. 2 - The 'Kook Yang No. 118' retrieving a gillnet. Five of these gillnetters operated in the 1969 high seas salmon fisheries off Alaska. They are 107 feet long, 133 gross tons, and appear to be the same basic ship as the seven Kook Yang otter trawlers operating in the same area.

Fig. 3 - The refrigerated processor 'Kook Yang No. 51'. Built in 1959 in Japan as a tuna longliner. She is 141 feet long, 338 gross tons, has three refrigerated holds, a sharp freeze capability of 5 tons daily, and a crew of 33. The Kook Yang No. 51 first appeared off Alaska in 1969 in the high seas salmon fishery.

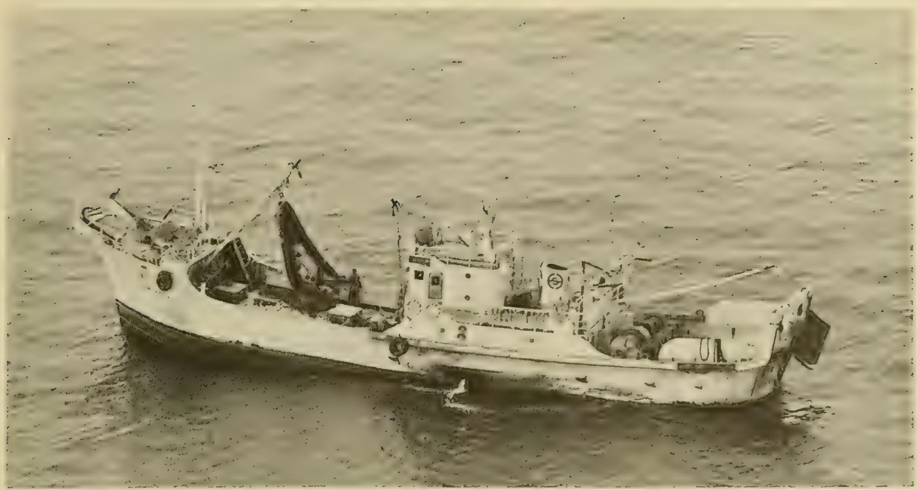


Fig. 4 - 'Kook Yang No. 112.' In 1969 seven trawlers of this type worked in the bottom trawl fishery off Alaska. They are 107 feet long and 133 gross tons. These otter trawlers are the same basic ship as the five Kook Yang gillnetters that operated in the same area of the eastern Bering Sea and approaches to Bristol Bay.

Fig. 5 - The South Korean stern trawler 'Kang Wha 601' is one of two similar ships which have operated off Alaska since 1968. Built in France in 1966, she is 252 feet long, 1,518 gross tons, with accommodations for a crew of 48. Equipped to both catch and process fish, she has a 900 cu. m. hold capacity and an 18 ton a day sharp freeze capability.

Fig. 6 - The stern trawler 'Keo Mun 501'. This ship is one of two similar French-built small trawlers first seen off Alaska in 1969. The Keo Mun 501, built in 1966, is 106 feet long and 223 gross tons.

Fig. 7 - The South Korean factory ship 'Shin Hung'. Built in Norway in 1947, she was operated by the Norwegians as the refrigerated processor 'Bataan' until 1967, then sold to Shin Hung Refrigeration Co. The Shin Hung is 508 feet long, 7,073 gross tons, with a crew of 200. She first appeared off Alaska in 1969, processing salmon and bottom fish catches from 7 trawlers and 5 gillnetters. She is equipped with: 1) a complete two-line canning plant (10 ton an hour capacity); 2) a reduction plant (25 ton daily capacity); 3) a sharp freezer (100 ton daily capacity); 4) refrigerated holds with a 2,900 ton capacity; and storage space for 400 tons of fish meal, 200 tons of fish oil, and 2,500 tons of canned fish.

SOUTH PACIFIC

Australia

TIGHTENS SHRIMP STANDARDS

Health standards for both imported and exported prawns (or shrimp) have been tightened by new regulations at Federal and State levels.

In New South Wales, the Department of Public Health set bacteria limits for frozen shrimp from any source. In Canberra, the Department of Primary Industry set new standards for frozen green shrimp. The standards have been observed voluntarily for years by importers, who have been paying to have all consignments tested as a health safeguard.

Bacteria Standards

The new regulations define prawn or shrimp as crustacea of families Penaeidae or Palimonidae. When cooked, prawn or shrimp on laboratory examination must comply with following bacteriological standards:

(1) total plate count at 37° C. (96.8° F.) shall not exceed 500,000 per gram; and

(2) count of E. coli (faecal type) shall not exceed 20 per gram; and

(3) count of coagulase positive Staphylococci shall not exceed 100 per gram; and

(4) there must be no salmonella or other pathogenic organisms.

What May Be Added

Permitted additions: Frozen cooked prawn or frozen cooked shrimp may contain ascorbic acid or erythorbic acid (iso-ascorbic acid) or their sodium salts as an antioxidant, in proportion not exceeding 400 parts per million (ppm).

Labelling

(1) Where ascorbic acid or erythorbic acid (iso-ascorbic acid) or their sodium salts is added to frozen fish fillets, or to frozen cooked prawn, or frozen cooked shrimp, those substances shall be deemed antioxidants in written statement on package, or on label attached to package.

(2) No statement shall be written on package, or on label attached to package, that ascorbic acid or erythorbic acid (iso-ascorbic acid) or their sodium salts have been added as vitamins.

Need for Export Standards

Australia's Chief Veterinary Officer said the need to protect this valuable trade has concerned his department and the Australian Fishing Industry Council (A.F.I.C.). He stated that ascorbic acid and sulphite compounds are now permitted for prawn held in storage pending final preparation. He warns against their overuse. The department has reservations about the use of sulphides. It is allowing it for the time being on A.F.I.C's recommendation. The regulation will be reviewed. In the meantime, discoloration or abnormal flavor or odor resulting from sulphide compounds may bring rejection.

Tolerances Permitted

Tolerances allowed include 2% of "soft-shell" in whole, headless, or prawn cutlets--but only a 1 percent tolerance in "deveined" or "cleaned" prawn. Total plate count of prawn tested bacteriologically must not exceed 100,000 organisms per gram. No pathogenic organisms are permitted. ('Fish Trades Review,' June.)

American Samoa

TUNA PRICES REACHED NEW HIGH IN AUGUST

Japanese tuna suppliers and U.S. packers in American Samoa agreed on a \$5-a-ton price increase for tuna deliveries in August. The new prices per short ton: round albacore: frozen US\$430, iced \$415; gilled-and-gutted yellowfin: frozen \$347.50. Both albacore and yellowfin prices represent new highs. ('Suisan Tsushin,' Aug. 4.)

AFRICA

Ghana

SEEKS JAPANESE ASSISTANCE

The Ghanaian fishery association recently asked the Japanese Fisheries Agency and the Japan Fishery Association to help it get technical assistance from a private Japanese firm.

The Ghanaian association wants to charter vessels with Japanese crews to develop a tuna fishery. It also wants to set up a small net-manufacturing plant. ('Minato Shimbun,' July 29.)

South Africa

JAPANESE CATCH MANY BLUEFIN TUNA OFF S. AFRICA

The Japanese tuna longliner 'Fukuhisa Maru No. 12' (370 gross tons) reported good fishing for southern bluefin tuna early in July southwest of Cape of Good Hope, South Africa. In 72 sets, the vessel took 150 metric tons of southern bluefin. This was double the average catch per day by vessels in the Tasman Sea off southeast Australia and in the Indian Ocean.

Southern Bluefin Found

According to the Yaizu Fishery Cooperative Association, there is considerable interest in the discovery of southern bluefin off the Cape of Good Hope. If examination shows the meat to be the same as bluefin, it would interest even scientists. ('Minato Shimbun,' July 4.)

Fishery Increased in August

By mid-August, numerous Japanese longliners were fishing southern bluefin off southern Africa, according to the Federation of Japan Tuna Fisheries Cooperative Associations (NIKKATSUREN). Between 60 and 70 vessels were on the Indian Ocean side, and about 10 were on the Atlantic side. Some vessels were able to land about US$417,000 worth in one trip.

Seeking African Port Privileges

NIKKATSUREN, foreseeing increasing fishing activity off Africa, recently sent an official to Lourenco Marques, Mozambique, East London and Port Elizabeth, South Africa, and Walvis Bay, South-West Africa, to secure port entry privileges for Japanese tuna vessels needing supplies. ('Katsuo-maguro Tsushin,' Aug. 15.)

Vessels May Switch From Tasman Sea

The bluefin fishery in the Tasman Sea off southeast Australia continued poor. Daily average was about 2 tons a vessel. In previous years, the longliners had concentrated in that region in August. This year, they were dispersed widely over the entire high-latitude region of the South Pacific. More vessels now are likely to seek the new bluefin grounds in the western Indian and Atlantic oceans. ('Suisan Tsushin,' August 5.)

Albacore Fishery Increases Off Angola & South Africa

Japanese, South Korean, and Taiwanese tuna vessels fishing albacore in the eastern Atlantic were making good catches off Angola and South Africa in July. Combined catch, since season began in early June, was about 15,000 metric tons, ahead of comparable 1968 landings. Although catch per vessel was lower than last year, the number of vessels (especially Taiwanese) had increased considerably. About 15 Japanese, 25 South Korean, and 50 Taiwanese vessels were fishing in early June.

The albacore fishery in the Indian Ocean, near Madagascar, started picking up in late July. Many vessels were averaging 4-5 tons a day.

Export Prices

Export prices for albacore shipments to Puerto Rico held steady in July. They were about US$530 a short ton c.i.f. for large sized (over 30 pounds), and $500 a ton for Grade A and $450 a ton for Grade B smaller sizes.

PREPARING DUNGENESS CRAB FOR SERVING

Harold Barnett, Arnold Einmo, and Roy Stevens

The general public is unfamiliar with the techniques used in preparing Dungeness crab for the table. This article provides that information. Procedures for cooking, cleaning, and cracking Dungeness crab are described and illustrated. Several popular Dungeness crab recipes are included.

The Dungeness crab, sometimes referred to as the San Francisco or Pacific crab, occurs in abundance on the Pacific coast from California to Alaska. Annual commercial catches of 30 million pounds or more are common.

The crabs grow to be comparatively large: frequently, they attain weight of $3\frac{1}{2}$ to $4\frac{1}{2}$ pounds. Weights of average individual crabs, however, are closer to 2 pounds.

Dungeness crabs are marketed in a variety of forms. These include live crab; whole, cooked crab (fresh and frozen); cooked sections (fresh and frozen); cooked meats (fresh and frozen); and heat-processed canned meats.

The body and leg meat from the Dungeness crab has a distinctive flavor and a delicate texture. Because of its fine flavor and texture, seafood gourmets find Dungeness crab dishes delightful.

Dungeness crabs have always been a popular seafood on the Pacific Coast, but until recently they have been relatively unknown in other parts of the country. Improved methods of transportation, however, have carried them to markets in the Midwest and on the East Coast, where they have been eagerly received by seafood fanciers. The general public, however, is unfamiliar with the techniques used in preparing Dungeness crab for the table.

Presented here are methods of cooking Dungeness crabs, cleaning and cracking them, and preparing Dungeness crab dishes.

I. COOKING DUNGENESS CRABS

To cook sufficient crabs for 6 servings:

1. Obtain 2 or 3 live crabs.

2. Add $\frac{1}{2}$ to $\frac{2}{3}$ cup of table salt to 8 quarts of fresh water, and heat the water to boiling.

3. Place the crabs in the boiling water.

4. After the water returns to a boil (the crabs will momentarily lower the temperature of the water below boiling), cover the pot, and cook the crabs for 15 to 20 minutes.

5. Remove the crabs from the pot, cool them in tap water, and drain them.

II. CLEANING AND CRACKING DUNGENESS CRABS

Clean and crack the cooked crabs in the following manner:

1. Remove the back (Figure 1).

2. Remove the gills (Figure 2).

3. Remove the mouth parts (Figure 3).

4. Remove the viscera from the body cavity by washing it in cold, running water (Figure 4). The yellowish fatty portion, or "crab butter," covering the viscera can be saved for later mixing in to salad dressing (optional).

5. Remove the tail flap (Figure 5) from the underside of the crab.

6. Place your hands on either side of the crab body (Figure 6), and press the body with a rolling motion to loosen body segments (optional).

7. Break the crab into halves, right and left.

8. Separate the legs (Figure 7) in such a manner that the adjacent body segment is attached to each leg.

9. To remove the body meat, grasp each leg as shown in Figure 8, and strike the leg against the side of the bowl.

10. Using a wooden mallet (Figure 9), crack each leg section.

11. Peel off the broken shell (Figure 10), and remove the meat.

12. To recover meats that do not shake out readily, use the tip of a crab leg as a pick (Figure 11).

Mr. Barnett is Research Chemist, BCF Technology Laboratory, Seattle, Wash.
Mr. Einmo is Fishery Marketing Specialist; Mr. Stevens is Program Coordinator — BCF Division of Marketing, Seattle.

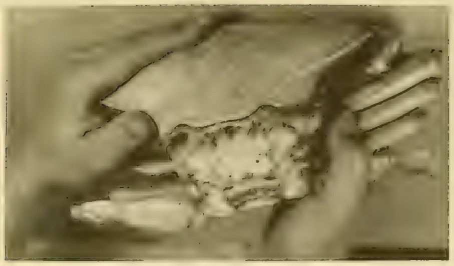


Fig. 1 - Removing the back.

Fig. 2 - Removing the gills.

Fig. 3 - Removing the mouth parts.

Fig. 4 - Removing the viscera with cold, running water.

Fig. 5 - Removing the tail flap from the u derside of the crab.

Fig. 6 - Loosening the body segments (optional).

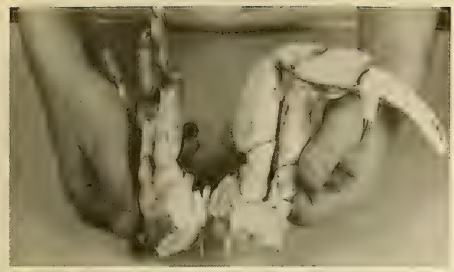


Fig. 7 - Separating the legs from the body.

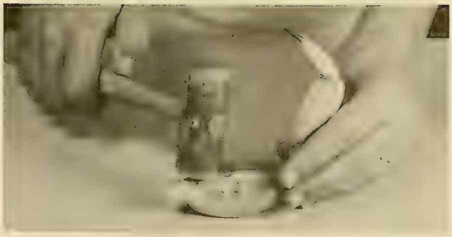


Fig. 9 - Cracking the shell from a leg portion.

Fig. 8 - Shaking body meat from a leg portion.

Fig. 10 - Peeling off broken shell.

Fig. 11 - Using the tip of a crab leg as a pick.

III. PREPARING DUNGENESS CRAB DISHES

The following 3 tested recipes on Dungeness crab salad, imperial crab, and crab Louis 1/ make eating Dungeness crab a pleasure.

A. DUNGENESS CRAB SALAD

The ingredients used in the Dungeness crab salad are:

1 pound of Dungeness crab meat
1 can (14 or 15 ounces) of artichoke hearts, drained
1 can (8 ounces) of cut green beans, drained
2 hard-cooked eggs, chopped
½ cup of sliced celery
¼ cup of sliced raw cauliflower
¼ cup of sliced cucumber
¼ cup of sliced green pepper
1 teaspoon of salt
¼ teaspoon of pepper
¾ cup of thousand island dressing
6 slices of tomato
6 leaves of lettuce
10 to 15 slices of radish

Prepare the Dungeness crab salad in this way:

1. Remove all shell or cartilage from the meat of the crab; be careful not to break the meat into small pieces.

2. Cut the crab meat into pieces one-half inch long.

3. Cut the artichoke hearts into fourths.

4. Combine all the ingredients except the tomatoes, lettuce, and radishes.

5. Toss the combined ingredients lightly.

6. Arrange a slice of tomato on each leaf of lettuce, and place about 1 cup of salad on each slice of tomato.

7. Garnish the salad with the slices of radish.

The amount of salad suggested serves 6 people.

1/These and other crab recipes prepared by Bureau of Commercial Fisheries home economists are in a publication, Test Kitchen Series No. 10, "How to Cook Crabs." The publication may be obtained from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

B. IMPERIAL CRAB

The ingredients for imperial crab are:

1 pound of crab meat
2 tablespoons of chopped onion
2 tablespoons of chopped green pepper
3 tablespoons of butter or other fat, melted
2 tablespoons of flour
½ cup of milk
½ teaspoon of salt
Dash of pepper
¼ teaspoon of Worcestershire sauce
2 hard-cooked eggs, chopped

Prepare the imperial crab in the following manner:

1. Remove all shell or cartilage from the crab meat; be careful not to break the meat into small pieces.

2. Sauté the onion and green pepper in butter until they are tender.

3. Blend the flour into the sautéed onion and pepper.

4. Add milk gradually, and cook the mixture, with constant stirring, until it is thick.

5. Add the seasoning, egg, and crab meat.

6. Place the imperial crab preparation in 6 well-greased individual shells or in 5-ounce custard cups.

7. Bake the crab preparation in a moderate oven (350° F.) for 20 to 25 minutes, or until the preparation is brown.

The amount of imperial crab suggested serves 6 people.

C. CRAB LOUIS

Supplied here are the recipes for crab Louis and for the Louis dressing to be used in the recipes.

1. Recipe for Crab Louis

The ingredients for crab Louis are:

1 pound of crab meat
1 head of lettuce
½ teaspoon of salt
1 cucumber, sliced
4 tomatoes, sliced
3 hard-cooked eggs, sliced

Prepare the crab Louis in this manner:

1. Remove all shell or cartilage from the meat of the crab; be careful not to break the meat into small pieces.

2. Shred the lettuce, and place it in a large, shallow, salad bowl.

3. Sprinkle the components of the salad with salt.

4. Arrange the crab meat over the lettuce.

5. Place alternate slices of cucumbers, tomatoes, and eggs around the edge of the salad bowl.

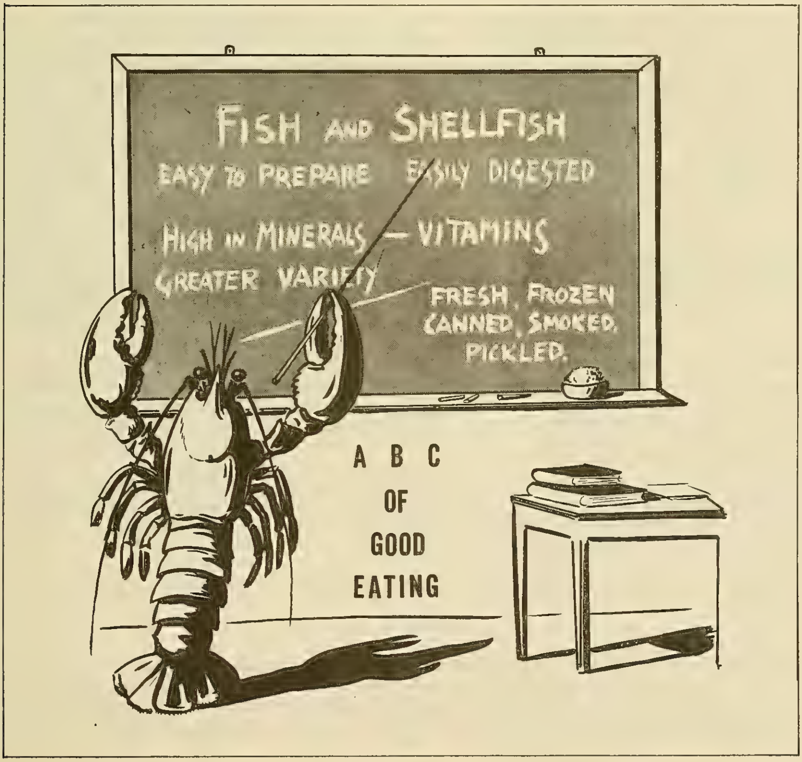
6. Spread Louis dressing over the crab meat.

2. Recipe for Louis Dressing

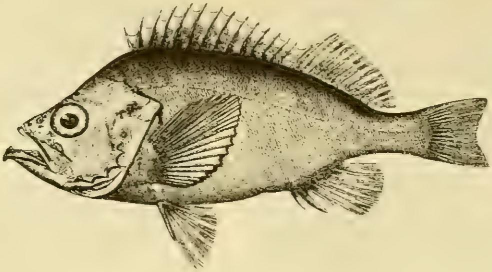
The ingredients for Louis dressing are:

1 cup of mayonnaise or salad dressing
3 tablespoons of catsup
2 tablespoons of chopped sweet pickle
1 tablespoon of lemon juice

Combine all ingredients and chill. The amount of dressing suggested is sufficient for 6 servings of crab Louis salad.



FOOD FISH FACTS



OCEAN PERCH

(*Sebastes marinus*) -- Atlantic
(*Sebastodes alutus*) -- Pacific

Ocean perch are truly the Cinderellas of the commercial fishing industry. Few were caught by hook and line and, although the otter trawl began to make some inroads on this unexploited species, the market was slight. This situation changed when, in the mid-1930s, a fish cutter discovered by chance that ocean perch yield small white fillets similar in taste and texture to fresh-water perch fillets. The fishing industry immediately began experimenting with filleting and freezing of this species. Although the original filleting began in Boston, both coasts of the United States harvest either ocean perch or several varieties of closely related rockfishes. The fishing industry entered a "Golden Era of Fishing" with these abundant families of fish.

DESCRIPTION

Ocean perch from the Atlantic are also called redfish or rosefish and range in color from orange to flame red, occasionally grayish or brownish red, with a lighter red on the belly side. The eyes are large and black, contrasting with the brightly colored body. Both jaws have many small teeth. The lower jaw, jutting out beyond the upper, has a bony knob at its tip which fits into a corresponding notch in the upper jaw. The ocean perch is a spiny fish having spiny projections on the sides of the large head as well as on the long, continuous back fin running from just back of the head almost to the tail. The Pacific coast rockfish number about 50 varieties and are very similar in appearance to their relatives in the Atlantic; however, they vary greatly in color variations. Pacific ocean perch are sometimes called longjaw rockfish.

Atlantic ocean perch average 1 to 2 pounds in weight and 12 to 15 inches in length. A $\frac{1}{2}$ pound perch is about $9\frac{1}{2}$ inches long; and a 4 pound perch is about 20 inches long. The maximum size is approximately 24 inches. Anything less than 8 inches in length is usually considered too small for commercial use.

Pacific ocean perch average 1 to $1\frac{3}{4}$ pounds and 12 to 16 inches in length.

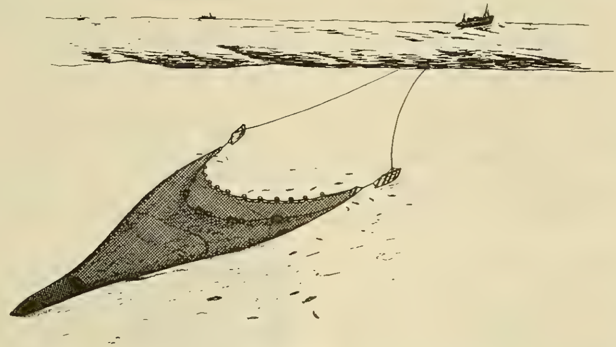
HABITAT

Ocean perch are found in the Atlantic from southern Labrador to the Gulf of Maine; in the Pacific, they range from the Bering Sea to lower California. Ocean perch prefer cold waters as a rule and are found most frequently in deep offshore waters. Perch taken from coastal waters are usually smaller and may be darker in color than those taken further out.

(Continued following page.)

OCEAN PERCH FISHING

Otter trawls are the most commonly used gear in the Atlantic coast fishery for ocean perch, with a trawling depth of approximately 300 to 750 feet. In the Pacific, the high-opening otter trawls are the most effective because the Pacific varieties do not congregate so close to the bottom as other species of these families.



OTTER TRAWL

CONSERVATION

Research vessels of the United States Department of the Interior's Bureau of Commercial Fisheries make regular information gathering cruises which enable scientists and fishery biologists to learn more about ocean perch and other fish, their environments, and factors affecting abundance. Regulations controlling trawl net mesh sizes are already in effect in some fisheries and are a part of the International Commission for the Northwest Atlantic Fisheries, whose 14 members include the United States, Canada, and 12 European countries. At the present time studies are being made and regulations considered by Bureau scientists which might be incorporated through ICNAF to prevent the depletion of ocean perch.

USES OF OCEAN PERCH

Ocean perch is an excellent food fish. The flesh, when cooked, is white and flaky and has a delicate flavor. Almost the entire catch of these fish is filleted, frozen, packaged, and sold at frozen seafood counters across the United States. There are usually about 8 fillets to a 1-pound package, they are moderate in price, entirely edible, and are easy and attractive to prepare and serve. (Source: National Marketing Services Office, BCF, U.S. Dept. of the Interior, 100 East Ohio, Room 526, Chicago, Ill. 60611.)

SEATTLE SEAFOOD SPECTACULAR

The nation's fishermen did not go down to the sea in ships October 5-8 but to Seattle, Washington, for the biggest Annual American Fish Exposition ever to be held. From a regional beginning in Boston three years ago, Fish Expo has grown nationwide, and in 1969, with many foreign countries joining in, will be the largest and finest fisheries exposition in the world. Congressmen, fishermen, wholesalers, retailers, advertisers, and representatives from every part of the fishing industry will be there with one main objective--how to bring more and better fish and shellfish to you, the American consumer. Seminars and talk sessions will be held, problems will be discussed, and everyone will be listening, looking, and learning new ways of improving the quality, packaging, transporting, and selling of fishery products.

Many of the Pacific Northwest's favorite fish will be enjoyed during Fish Expo 1969. Among these will be Pacific ocean perch, now on its way to greater prominence in the nation's markets. Very similar in taste to the more widely-known Atlantic perch, Pacific ocean perch varies slightly in size and coloration. Ocean perch are usually filleted, frozen, and packaged for sale at frozen seafood counters across the United States. The white, flaky, delicately-flavored fillets are excellent eating and they are economically priced.

Chipper Perch, a Bureau of Commercial Fisheries recipe, allows you to eat like a king and no one will ever know, unless you tell, that this recipe is very easy on the budget. The fillets have a dip in Caesar dressing, then a topping of crushed potato chips and Cheddar cheese before being baked in a hot oven. Chipper Perch is meltingly tender after only 10 to 15 minutes baking and ready to serve with its crunchy cheese crown. This recipe offers a whale of an idea for the homemaker--feed the family like royalty while saving money and preparation time.

CHIPPER PERCH

2 lbs. ocean perch fillets or other fish fillets, fresh or frozen	1 cup crushed potato chips
$\frac{1}{2}$ cup Caesar salad dressing	$\frac{1}{2}$ cup shredded sharp Cheddar cheese

Thaw frozen fillets. Dip fillets in salad dressing. Place fillets in a single layer, skin side down, on a baking pan, 15 x 10 x 1 inches. Combine crushed chips and cheese. Sprinkle over fillets. Bake in an extremely hot oven, 500° F., for 10 to 15 minutes or until fillets flake easily when tested with a fork. Makes 6 servings.

Chipper Perch is one of 25 quick-fix recipes, some economy and some gourmet, in 'Time For Seafood,' a full-color booklet published by the Bureau of Commercial Fisheries. All recipes have been especially planned to give you TIME--time to enjoy, time to relax, time to do your thing. For these flavorful ways to beat the clock, send 45¢ to the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 and ask for 'Time For Seafood,' Fishery Market Development Series No. 12 (I 49.49/2:12). (Source: National Marketing Services Office, BCF, U.S. Dept. of the Interior, 100 East Ohio Street, Room 526, Chicago, Ill. 60611.)

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HOW OLD IS THE SCIENCE OF OCEANOGRAPHY?

Mankind has been interested in the oceans since before the time of Aristotle, who wrote a treatise on marine biology in the fourth century B.C. The early studies of the ocean were concerned with problems of commerce; information about tides, currents, and distances between ports was needed.

While he was Postmaster General, Benjamin Franklin prepared temperature tables by means of which navigators could determine whether or not they were in the Gulf Stream. This resulted in faster mail service to Europe.

The beginning of modern oceanography is usually considered to be December 30, 1872, when HMS CHALLENGER made her first oceanographic station on a 3-year round-the-world cruise. This was the first purely deep-sea oceanographic expedition ever attempted. Analysis of sea water samples collected on this expedition proved for the first time that the various constituents of salts in sea water are virtually in the same proportion everywhere (Dittmar's principle).

Even before the CHALLENGER expedition, Lt. Matthew Fontaine Maury of the U.S. Navy was analyzing log books of sailing vessels to determine the most favorable routes. He did much to stimulate international cooperation in oceanography and marine meteorology. The present U.S. Naval Oceanographic Office is an outgrowth of his efforts. ("Questions About The Oceans," U.S. Naval Oceanographic Office.)

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UNITED STATES DEPARTMENT OF THE INTERIOR
Walter J. Hickel, *Secretary*
Russell E. Train, *Under Secretary*
Leslie L. Glasgow, *Assistant Secretary*
for Fish and Wildlife, Parks, and Marine Resources
Charles H. Meacham, *Commissioner*, U.S. FISH AND WILDLIFE SERVICE
Dayton L. Alverson, Acting Director, BUREAU OF COMMERCIAL FISHERIES

As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States -- now and in the future.

BACK COVER: A view of storied Gloucester, Mass. Foreground, an old offshore trawler now used as carrier vessel. (Photo: Frank Riley)

COMMERCIAL FISHERIES Review

VOL. 31, NO. 11

NOVEMBER 1969

COVER: This giant, 25-pound, lobster was caught in the offshore waters of New England. BCF biologists are studying the lobster fishery to determine if the offshore and inshore fisheries compete for same supply of lobsters. In any case, the fishery must be managed properly to insure a continuing source.

COMMERCIAL FISHERIES

Review

A comprehensive view of United States and foreign fishing industries--including catch, processing, marketing, research, and legislation--prepared by the Bureau of Commercial Fisheries.

Fishermen's Memorial
Gloucester, Mass.

Managing Editor: Edward Edelsberg
Associate Editor: Barbara Lundy

Production: Jean Zalevsky
Alma Greene
Mary Andrews

The Bureau of Commercial Fisheries and The Bureau of Sport Fisheries and Wildlife make up The Fish and Wildlife Service of The United States Department of the Interior.

Throughout this book, the initials BCF stand for the Bureau of Commercial Fisheries.

Address correspondence and requests to: Commercial Fisheries Review, 1801 North Moore Street, Room 200, Arlington, Va. 22209. Telephone: Area Code 703 - 557-4246.

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CONTENTS

PROGRAM TO STRENGTHEN U.S. MARINE-SCIENCE ACTIVITIES IS ANNOUNCED

A 5-point program to strengthen U.S. marine-science activities was announced on October 19 by Vice President Spiro T. Agnew as Chairman of the National Council on Marine Resources and Engineering Development (NCMRED).

He said the Administration has selected 5 areas "for immediate special emphasis in the next fiscal year" while the Administration and Congress work out a long-term program.

Money will be provided to carry out the 5 programs. Each program will be assigned to an appropriate Federal agency while studies of the organization of U.S. marine-science activities continue.

The 5 priority programs were picked after an intensive Government-wide review of the Nation's urgent needs in marine affairs.

President Nixon requested the study in February after receiving the Report of the Commission on Marine Science, Engineering and Resources--"Our Nation and the Sea." (See CFR, Feb. 1969.)

I. COASTAL ZONE MANAGEMENT

A new U.S. policy will be fashioned "to promote the national development of coastal areas and the Great Lakes." A grant program will aid States to plan and manage coastal activities.

New legislation will help insure that rapid coastal development does not destroy limited land and water resources. All interests in the coastal regions would be assured consideration--"for port development, navigation, commercial fishing, mineral exploitation, recreation, conservation, industrial development, housing, power generation and waste disposal."

The Administration anticipates that grants will be given for these purposes: 1) development by States of planning and regulatory mechanisms; and 2) operation of these State management systems. The latter grants would be made if States demonstrate the capability to prepare plans that provide for:

- "balanced use of the coastal margin, both land and water, that considers viewpoints of all potential users";

- "access to management-oriented research, including coastal ecology studies";

- regulatory authority as needed--zoning, easement, license, or permit arrangements--to insure development consistent with State plans;

- "consideration of the interests of adjacent States";

- land acquisition and power of eminent domain when necessary to implement the plan; and

- review of proposed U.S., U.S.-assisted, State, and local projects to insure consistency with plans.

Mr. Agnew believes that this program should strengthen the capabilities of States to manage coastal resources, lessen the need for Federal intervention, and "facilitate integration of planning, conservation, and development programs among diverse public and private interests."

II. ESTABLISHMENT OF COASTAL LABORATORIES

Coastal laboratories will be set up, supported by the U.S. Government, "to provide information on resource development, water quality, and environmental factors to assist State authorities and others in coastal management."

Existing facilities will be strengthened in order to:

- develop basic understanding and to describe the ecology of the 13,000-mile coastline. Ecology--the interrelationship of organisms with their environment--differs with regions.

- anticipate and assess the impact on a region's ecology of alternative land uses, of pollution, and of changes in the land-water interfaces;

- operate coastal monitoring networks; and

- perform analyses needed for coastal management.

III. PILOT TECHNOLOGICAL STUDY OF LAKE RESTORATION

A pilot study of a lake will be carried out to determine the feasibility of restoring the Great Lakes with technological and regulatory mechanisms. Present environmental technology and techniques will be tested. These will include "pollution measuring devices, methods of artificial destratification by aeration, mixing and thermal upwelling techniques, thermal pollution control and enrichment, artificial bottom coating, filtering, harvesting of living plants and animals, and restocking of fishery resources." The program will reinforce investigations now underway. Specialists from industry, academic institutions, and Federal laboratories will add their skills to these studies.

IV. INTERNATIONAL DECADE OF OCEAN EXPLORATION

"The United States will propose a range of specific programs as its initial contribution to the International Decade of Ocean Exploration during the 1970s." The U.S. proposed the Decade, which was endorsed by the UN General Assembly in December 1968. Funds will be provided for the U.S. share.

The United States proposes international emphasis on these goals:

- Preserve the ocean environment by accelerating scientific observations of the ocean's natural state and its interactions with the coastal margin. This would be done to provide a basis for (a) assessing and predicting man-induced and natural modifications of

the oceans' character; (b) identifying damaging, or irreversible, effects of waste disposal at sea; and (c) understanding the interaction of levels of marine life to prevent depletion or extinction of valuable species as a result of man's activities.

• Improve environmental forecasting to reduce hazards to life and property--and permit more efficient use of marine resources. This would be achieved by improving physical and mathematical models of the ocean and atmosphere to provide basis for "increased accuracy, timeliness, and geographic precision of environmental forecasts."

• Expand seabed-assessment activities to permit better management--domestically and internationally--of ocean mineral exploration and exploitation. Acquisition of needed knowledge of "seabed topography, structure, physical and dynamic properties, and resource potential" would help to achieve these goals.

• Develop an ocean-monitoring system to make it easier to predict oceanographic and atmospheric conditions. The system could be developed through design and deployment of oceanographic data buoys and other remote sensing platforms.

• Improve worldwide data exchange by modernizing and standardizing U.S. and international marine data collection, processing, and distribution.

• Accelerate Decade planning so that there will be more international sharing of the scientific equipment, responsibilities, and costs of ocean exploration.

This U.S. contribution to an expanded program of intergovernmental cooperation reflects 4 recent developments:

(1) Greater population concentration along the coasts of the U.S. and other countries. This could harm the ocean environment and increase demands on coastal margins and marine resources.

(2) Growth of technology that is rapidly opening new ocean frontiers.

(3) Scientific advances that can improve environmental forecasts if better ocean data are available.

(4) 100 coastal nations are showing more interest in benefiting from marine activities.

The Decade will speed the needed understanding of the ocean. It will permit nations individually to plan investments and, collectively, to arrange for preserving the ocean environment and managing ocean resources.

The oceans are global. The scope of work to be done makes international cost sharing and data exchange very attractive. International cooperation in marine affairs may facilitate communication with developing nations, with the Soviet Union, and with others.

The National Council on Marine Resources and Engineering Development says the U.S. proposals are compatible with the ocean exploration program of UNESCO's Intergovernmental Oceanographic Commission. The U.S. contribution to this program will depend on the contribution of other nations.

V. ARCTIC ENVIRONMENTAL RESEARCH

Arctic research activities will be intensified. These will permit fuller utilization of the rapidly developing area. The research will insure that this use does not degrade, through neglect, the Arctic environment. It will accumulate knowledge on the interaction of man with the Arctic environment.

The program will be directed to: (1) the polar icepack to include its impact on transportation and global weather and climate; (2) the polar magnetic field and its effects on communication; (3) geological structures underlying the Arctic lands and polar seas--as potential mineral sites and as hazards to construction and resource development; (4) balance of the Arctic ecologic system; (5) the presence of permafrost; and (6) slow degradation of liquid and solid wastes under Arctic conditions. Behavior and physiology of man also will get more attention.

In the beginning, the emphasis will be on strengthening and broadening Arctic research capabilities. Formulation of an overall policy framework for Arctic-related activities also will be considered.

WENK COMMENTS ON 5-POINT PROGRAM

In a press conference preceding announcement of the 5-point program, Dr. Edward Wenk Jr., executive secretary of the National Council on Marine Resources and Engineering Development, said:

- "The states are pivotal to solving our coastal problem. We need the states to help us manage our ports, our fisheries, our waste disposal, conservation--you name it, they're all part of the same thing."

- The 13,000-mile coastline: "We want to know what's there, and then we want to find out what's happening to it."

- Pilot study of lake pollution: A lake of several hundred square miles would be polluted. Then an attempt would be made to clean it up by chemical, thermal, mechanical and biological means.

"This will be difficult," Dr. Wenk concluded, "but we have to start somewhere. These things can't wait."

• International Decade of Ocean Exploration: Some funds already have been authorized. More would be sought to increase research of the oceans to find out how man is polluting them and how he can reduce that pollution.

• Arctic: Intensify marine research in area where oil, gas, and mining exploration is increasing--and where pollution is special problem because of intense cold.

The National Council

The National Council on Marine Resources and Engineering Development was established by Public Law 89-454 to assist the President in developing and coordinating national marine-science policies and programs. The members are:

Chairman:

Spiro T. Agnew, the Vice President

Members:

William P. Rogers, the Secretary of State

John H. Chafee, the Secretary of the Navy

Walter J. Hickel, the Secretary of the Interior

Maurice H. Stans, the Secretary of Commerce

Robert H. Finch, the Secretary of Health, Education, and Welfare

John A. Volpe, the Secretary of Transportation

Glenn T. Seaborg, Chairman, Atomic Energy Commission

William D. McElroy, Director, National Science Foundation

Observers:

Lee A. DuBridge, Director, Office of Science and Technology

Robert P. Mayo, Director, Bureau of the Budget

Paul W. McCracken, Chairman, Council of Economic Advisors

Thomas O. Paine, Administrator, National Aeronautics and Space Administration

John A. Hannah, Administrator, Agency for International Development

S. Dillon Ripley, Secretary, Smithsonian Institution

Executive Secretary:

Edward Wenk Jr.

UNITED STATES

HICKEL URGES WORLD ACTION TO PROTECT & DEVELOP ARCTIC RESOURCES

A 3-day Polar Plan Conference on Arctic problems ended in Shenandoah National Park, Va., on Oct. 1 with a request by Secretary of the Interior Walter J. Hickel that future Arctic plans be viewed from an international standpoint.

He said: "Knowledge of the world's polar regions will change not only the countries bordering on the Arctic--it will change economic, social and cultural conditions throughout the world. I urge you to think of the Arctic as a single entity, so that all nations can contribute to its conservation and the wise use of its resources.

"The North Country is beginning to undergo the most rapid and profound changes ever seen in any wilderness region in world history. It is unlike any other region in the world in many other ways.

"All of us--throughout the world--who work with the Arctic must find new ways to meet this unprecedented challenge. We need new ideas, new techniques and attitudes, perhaps even new institutions, and we need them in every nation involved in the Arctic."

Involve Alaska's Natives

Secretary Hickel urged that Alaska's native Indians, Eskimos, and Aleuts be given every opportunity to take part in decisions involving the Arctic and the work now being undertaken by industry and government.

Unlike most other workers, he noted, Alaska Natives are accustomed to the land and its climate. Their rate of turnover on the job can be expected to remain low. Their keen personal interest in preserving their environment makes them most likely to respect it and work in harmony with it as much as possible. He emphasized that human values must be given paramount attention. All developmental problems must be considered in terms of their effects on people.

The Conference was attended by 100 representatives of industry, science, conservation, and government to exchange ideas about the North's spectacular boom. Canada and Norway sent high officials.

INTERIOR DEPARTMENT LIMITS FISHERY LOANS TO $40,000

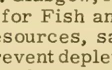
High interest rates charged by commercial lending institutions have led to an unprecedented demand for fishery loans from the Bureau of Commercial Fisheries. This has required BCF to limit such loans to $40,000 per transaction.

Dr. Leslie L. Glasgow, Assistant Secretary of the Interior for Fish and Wildlife, Parks, and Marine Resources, said the action was necessary to prevent depletion of the loan fund during the next few months and to assure better distribution of the money still available. The current rate for fishery loans is $7\frac{1}{2}$ percent; maximum maturity is 10 years.

Purposes of Loans

Dr. Glasgow said loans are made to finance or refinance the purchase, construction, maintenance, repair, equipping, or operation of commercial fishing vessels or gear. Applications in the first two months of fiscal 1970, which began July 1, 1969, more than doubled applications of a year earlier.

The BCF-administered loan program is scheduled to expire in 1970. Interior Department has recommended extension.



EASTERN PACIFIC YELLOWFIN TUNA CATCH RATE IS CHANGED

The incidental catch rate of yellowfin tuna in the eastern Pacific Ocean for seine vessels of 300 short tons capacity or less reverted to 15 percent on October 2, 1969. This applies to vessels that fish any part of a trip within the regulated area.

THE SHRIMP SITUATION

During January-September 1969, 84.3 million pounds of shrimp (heads-off) were landed in the Gulf States, 10% below the 93.9 million pounds of the 1968 period and 23% below 1967 period.

Heavier September landings were recorded in Florida (West Coast), Alabama, Mississippi, and Louisiana; landings declined in Texas. In eastern and central Gulf, greater abundance of white shrimp improved landings somewhat. White shrimp were not prevalent in Texas.

Of considerable significance were the heavier landings in Mississippi, where the August hurricane devastated most processing facilities. However, the fleet was only slightly damaged and fishing resumed as soon as fishermen got their personal affairs in order.

No High Catch Rate

Of some significance was the fact that shrimp fishing always is excellent for a week or ten days following a hurricane. A possible reason is that the storm chills the water and results in premature schooling of shrimp. Surprisingly, no such high rate of catch was recorded following this hurricane. Some possible causes for this: (1) excessive debris deposited on fishing grounds as result of this devastating storm, (2) local fishermen did not fish for a week or more because of the unusually high incidence of personal loss at home; and (3) fishermen from other areas failed to move into the area because they were uncertain of landing conditions; or, more likely, since catches in the area had been running behind a year ago, they did not expect unusual catches.

Prices Begin To Weaken

Prices generally have been holding firm but have begun to weaken. On October 1, cold-storage holdings were 52.9 million pounds--7.7 million pounds above a year earlier. However, most of this increase, about 5 million pounds, is in breaded, peeled, and deveined; holdings of raw headless are up only 2.8 million.

Most holdings of raw headless, shell on, are of larger sizes and very little small shrimp is available. This is substantiated by conversations with industry and by examination of import and catch data.

Imports

For first 8 months of 1969, imports of raw headless shell on, for example, are one million pounds less than a year earlier; peeled and deveined are 13 million pounds greater than a year earlier. Imports of all types are up about 9 million pounds over a year earlier (109 compared with 117).

GULF MENHADEN FISHERY SETS RECORD

The 1969 season total of menhaden landings along the Gulf of Mexico coast through August was 36% ahead of the 1968 period and 7% better than the comparable period in 1962, the record year.

Despite Hurricane Camille, August 1969 landings about equalled August 1968 landings.

Gulf production was not matched by the Atlantic Coast fishery. There, landings through August 1969 dropped 36% from 1968 and 66% from 1963--the last year of a billion-fish Atlantic fishery.

MANAGEMENT OF MENHADEN FISHERY IS SUGGESTED

Midseason reports show that menhaden, the primary raw material for the Atlantic Coast fish-reduction industry, again have failed to appear in commercial quantities from Delaware to Rhode Island. This was reported in September by the University of Rhode Island (URI) Commercial Fisheries Newsletter. Although some catches were made, the total was less than 10% of the maximum production in previous years.

Fishing on Chesapeake Bay has dropped sharply below 1968. This is strong indication that menhaden will be scarce throughout the middle and north Atlantic grounds during the 1970 season.

The Gulf of Mexico fishery is the one bright spot. The menhaden catch to midseason was exceptionally heavy. It is possible that the fishery may set a record in 1969.

Gulf Landings Rise

Because of the progressive decline of the Atlantic Coast stocks of menhaden, it is time to pay more attention to the Gulf stocks, the URI newsletter states. Gulf landings have continued to increase. This might be interpreted to mean that the maximum sustainable annual yield has not yet been reached. But continued unrestricted fishing pressure could push this fishery toward extinction.

Management Overdue

Much of the fishing industry is highly independent and opposed to regulation or imposition of quotas. But intelligent management of resources has been beneficial to many fisheries. The application of basic principles of resource management to the menhaden fishery would appear long overdue, the URI newsletter concludes.

ALEWIFE DIE-OFF IN GREAT LAKES IS MINOR

The die-off of alewives in the Great Lakes reached nuisance proportions in only a few areas this year, reports the Great Lakes Commission. Lake Michigan's southern end experienced a "fairly heavy mortality" of the silvery little fish which littered the beaches. In recent years, alewife die-off has been a particular problem in this lake.

In Chicago, park district workers were busy in early July scooping up alewives. Later in July, the die-off was "substantial" along the Indiana shoreline. Around July 21, a sudden rise in temperature of 11-12 degrees in about 48 hours appeared to have triggered the deaths of the temperature-sensitive fish, BCF researchers reported.

Fewer Near Milwaukee

In the Milwaukee, Wisc., area, fewer alewife deaths were reported than in 1968, when the die-off was "moderately light." Vessel and plane surveys found sizable amounts of floating dead fish in the lake's southeastern section in late July. No major concentrations fouled Michigan's lower peninsula shoreline.

Reports from the Lake Ontario area showed that no significant problem had developed this year.

UNDERWATER TUNA SCHOOL TRACKED BY SONAR

For the first time, scientists have tracked a school of tuna underwater using the oceanic equivalent of radar. The feat was accomplished by BCF scientists aboard the Bureau's research vessel 'Townsend Cromwell' in Hawaiian waters in early September. On two occasions, the vessel used sonar to track a skipjack tuna school continuously, for a total of 6 days and 6 nights. Directing the operation was biologist Heeny S. H. Yuen.

The scientists believe they have uncovered some startling aspects of skipjack tuna behavior. Here is their report:

A skipjack tuna school, such as this one, spends the daylight hours near land and comes to the surface layers only infrequently. Toward sunset, the school heads to the open sea, spends the entire night in the surface layers, and travels as far as 60 miles from land. With the coming of dawn, the school returns to the original coastal site, or nearby.

All are facts that carry important implications for biologists and fishermen. They offer clues to the design of new fishing gear and techniques that could open up new fisheries or improve existing ones.

Cromwell's Special Equipment

The Cromwell is equipped with specially designed sonar. Sonar gear detects high-frequency sound waves in water in much the same way that radar detects electromagnetic waves in air. The sonar is a continuous-transmission, frequency-modulated (CTFM) device. It sends out a continuous sonar signal. When the signal is reflected by an object, such as a fish or fish school, the gear can tell the object's distance from the ship, its direction, and depth. This is the sonar's "active" mode.

The sonar also has a "passive," or listening, mode: It listens for acoustic signals emanating underwater. The Cromwell used both modes in tracking the tuna school.

Skipjack Fed Acoustic Tag

Trolling near Kaula Island, a rocky islet about 35 miles southwest of Kauai, Hawaii, the vessel's party caught an 18-inch skipjack tuna. The fish was fed an acoustic tag. This is a cylindrical, battery-actuated, transmitter 3 inches long and less than an inch in diameter. The transmitter produces a short, high-frequency burst of ultrasonic waves at the rate of two a second. These bursts have a frequency of 50 kiloHertz. They cannot be heard by human beings--but are easily detected up to a mile away by the sonar. Earlier experiments in shoreside tanks had shown that a skipjack tuna would accept the tag and continue to swim and eat as usual.

When the tagged skipjack tuna was released, it rejoined the school. This was proved in two ways: First, in the passive mode, the sonar picked up the signal from the transmitter. Switched to the active mode, while trained on the same location, the sonar detected the school of which the tagged fish must have been a member. Second, on one occasion, the fish was lost for a few minutes. Soon observers on deck noticed a school of skipjack tuna feeding at the surface. The sonar was trained on the school and the familiar two-a-second signal of the tagged fish was picked up. Thus, the movements of the tagged fish were taken as representative of the movements of the school.

During Daylight

During daylight hours, the school kept close to the vicinity of Kaula Island, which is surrounded by a narrow shelf about 80 feet deep. About a mile from shore, the shelf breaks into a steep cliff that sweeps down into ocean depths of several thousand feet. It was near this break in slope that the school was first observed; the school returned to it on most mornings. The terrain closely resembles an underwater cliff off Oahu where, in 1966, BCF scientists in a small submarine observed skipjack tuna feeding at 500 feet.

Sundown: Toward Open Sea

Shortly before sundown, the school turned from the bank and swam toward the open sea. The direction of travel varied. One night the school swam southwest, another east, another north. The distance traveled also varied, from 30 miles to about 60. The varied distances mean the school had to adjust its speed to arrive at the Kaula Rock site at dawn. On the 60-mile journey, Heeny Yuen says, the school was swimming at the very

high average speed of 8 knots for more than an hour.

Surface Layer At Night

At night the school kept to the surface layer of the water. It swam steadily in a straight line for an hour or more; often it would pause for as long as an hour. Then it would change direction and swim on.

At the time, the night sky was heavily overcast. To Yuen, it seemed improbable that the fish could be navigating by starlight.

Only on one occasion did the school break its established pattern of movement. Then, instead of returning to the bank at daybreak, it remained 5 miles off the island all day. On the next morning, however, it was back on the bank.

"As she has with many other animals," Yuen says, "Nature has endowed the skipjack tuna with an internal compass and an internal clock."

Tracking the School

The observations of the school's movements were made during two periods. During the first, the vessel tracked it for 2 days and 2 nights, and then had to return to Honolulu for sonar repair. Two days later, it returned to Kaula Island and, within a few hours, again picked up the transmitter signal. The fish was at its accustomed place over the break in slope.

Four more days and nights were then spent tracking the school. The transmitter has a battery life of 200 hours, and the experiment could have lasted at least 2 more days and nights, but Yuen decided that he had learned all he wanted to learn from that school.

Questions About Larger Fish Unanswered

Skipjack tuna form the basis of Hawaii's largest fishery. The catch peaks sharply in summer, when large fish of about 20 pounds are most commonly caught. The fish that was tagged weighed only 3 pounds--so it was far from representative of the bulk of the commercial catch. Since fish schools usually are made up of fish of about the same size, the new information fails to answer questions about the behavior of the larger and older fish.

Some biologists theorize that there is a "resident" population of skipjack tuna around the Hawaiian islands throughout the year, and that the "season" fish are a migrant population. The biologists are eagerly speculating about the results they would get if they succeeded in tagging and following a large tuna.

It is known that the fish, or at least some of them, migrate thousands of miles. But how long these migrations last and the routes taken are matters of speculation. Positive information might help to open the immense central Pacific skipjack tuna fishery to commercial harvest. The yield of the fishery is estimated in the hundreds of thousands of tons; only about 5,000 tons a year now are taken by the Hawaiian fleet.

Richard S. Shomura, Acting Area Director, BCF, Honolulu, says plans are being developed to carry out extensive experiments with tagged skipjack tuna, especially the "season" fish, during the 1970 fishing season.

EAST COAST CLAM DREDGE TESTED OFF OREGON

The BCF Exploratory Fishing Base in Seattle, Washington, reports that the Bureau research vessel R/V 'John N. Cobb' recently returned to Seattle after a 19-day clam-gear testing cruise along the Oregon coast between Coos Bay and Newport.

Eighty-five tows were made with an East Coast 36-inch-bar hydraulic clam dredge at depths from 5 to 15 fathoms. The dredge worked efficiently, without mechanical breakdowns. Seattle gear specialists feel the dredge can be adapted successfully to West Coast conditions.

Only small quantities of razor clams and cockles were collected during the cruise. Very large catches of sand dollars, up to 4 tons per 15-minute tow, necessitated making shorter tows.

DESTROYER'S SONAR TRACKS WHALE

Two marine biologists working for the U.S. Naval Oceanographic Office aboard a destroyer in the Atlantic visually identified sonar "echoes" as a whale.

Biologist William T. Leapley reported: "This was one of those rare incidents--the first time we have been able to verify a sonarman's classification of an 'echo' as a whale sonar target by first actually tracking the source of the contact and then by visually identifying it as a whale--in this instance, a group of five finback whales."

Leapley and his associate, Coleman Levenson, had just completed an investigation into biological sonar targets when sound signals indicating possible whales were received.

Leapley recalled: "At that time, we were off Cape May, steaming toward Newport, Rhode Island. . . .Prior to this, the sonarmen aboard the ship had reported what they thought were the 'echoes' of sound signals bouncing off the bodies of whales, but we had yet to confirm any of these reports through visual identifications of the 'echo' sources.

"So when a sailor awakened me just before dawn on a summer morning to report a whale off the ship's starboard side, I thought that this might be the sighting we had been hoping for. After dashing up to the bridge to have a look, I learned that the 'sighting' was just another sonar contact classified 'probable whale' by the senior sonarman.

"I was about to write it off as a frustrating near miss when Cole (Levenson) arrived on the scene with the suggestion that we try to track down this target and really get some proof of its identity."

Whale Hunt

They received permission to hunt for the whale. As the ship headed at 28 knots back to where the sonarman first picked up the whale contact, they scanned the predawn horizon. Then, dead-ahead, the marine biologists saw "this great long form stretching out in the path of the ship. We would have cut it in half, if we hadn't taken right rudder evasive action. And there lying near our ship were two huge finback whales, 65- to 75-foot specimens that had just surfaced."

The finbacks rank second in size to the blue whales, which reach a maximum of 100 feet. "But the blue whales," Leapley notes, "are becoming very rare, almost extinct due to over-whaling." Finbacks feed on small planktonic organisms through a unique baleen mouth apparatus that works like a sieve.

Maneuvering Around Them

Almost as soon as the marine biologists spotted the two adult finbacks, the destroyer's skipper began to maneuver the vessel in a tight circle around them. Leapley recalls: "About half-way around, the whales dove. Then, about five minutes later, they surfaced again. At about the same time, we noticed that two more adults and a juvenile had also surfaced approximately 100 yards away. By this time, Cole was snapping pictures of the whales."

The skipper was able to maneuver the destroyer to a point 20 yards away from two adult and one juvenile whale--and the biologists got a very good view.

Echoes Tape Recorded

During the 45 minutes the scientists maintained visual contact with the 5 whales, the ship's sonarmen tape-recorded echoes bounced off the mammals' bodies on equipment connected to the ship's sonar.

Leapley concluded: "The tape containing the sounds now definitely determined to be whale echoes will be analyzed further to learn what a whale looks like on sonar equipment. Results of this analysis will eventually help the Navy to classify the mammals."

UNIVERSITY CURRICULA IN MARINE SCIENCES PUBLISHED

The National Council on Marine Resources and Engineering Development has published a compilation of institutions offering courses and degrees in marine sciences during the 1969-70 and 1970-71 academic years. It is entitled "University Curricula in the Marine Sciences and Related Fields."

The publication will help prospective students, research workers, and instructors

identify career opportunities and it will foster full use of educational facilities. In the foreword, Edward Wenk Jr., Executive Secretary of the Marine Sciences Council, emphasizes that skilled manpower is central to achievement of long-range national goals in marine sciences. It is the individual talents that pace our progress, he emphasizes.

What Report Contains

The report is based on information provided by the institutions in response to a questionnaire. Institutions are listed under 5 major categories: Marine Science, Ocean Engineering, Maritime Officers, Fisheries, and Marine Technicians. Each program is described in terms of teaching and research facilities--laboratories, classrooms, ships, computers--and academic programs and staff. Degrees offered and degree requirements are described.

It is available for $2 from the Superintendent of Documents, U.S. Government Printing Office, Washington, D. C. 20402.

U. S. AIDS GULF OF MEXICO OYSTER INDUSTRY

BCF made available $281,388 in October for the hurricane-damaged oyster industries in Louisiana, Alabama, and Mississippi. The Bureau had determined that a resource disaster occurred when Hurricane Camille ravaged the 3 coastal areas in August 1969.

The money will be used to restore seed oyster grounds under State jurisdiction; $176,388 was allocated to Louisiana, $85,000 to Mississippi, and $20,000 to Alabama. The projects are financed 100% with Federal funds.

BCF acted quickly to provide the funds because the timing of restoration is important: oyster larvae begin arriving in these Gulf Coast waters during October and must have clean shells to which they can attach during their early life.

SENSOR STUDIES TEMPERATURE-FISH MIGRATION RELATIONSHIP

Coast Guard planes flying monthly missions at 130 knots, from 200 to 600 feet above Atlantic and Pacific coastal waters, are becoming valuable parts of the fisherman's gear. Some of the information obtained on these flights is used by the Bureau of Sport Fisheries and Wildlife to "determine the relationship between surface temperatures and the distribution of migratory game fish." The findings also are useful to commercial fishermen; the data may help in predicting the movements of fish from the temperatures the fish are known to tolerate.

The temperatures are detected ("read") with a Barnes infrared thermometer sensor, which transmits them to a strip-chart recorder. The sensor is aimed through a small hatch in a rear window of the plane. Also, scientists note on the chart what they see below.

The Sensor

The sensor exploits the principle that for certain wavelengths the amount of infrared radiation given off by an object is proportional to the surface temperature of that object.

The sensor can be used at virtually any distance--so long as the target fills the field of view. It responds in a fraction of a second; it is ideal for measuring sea-surface temperatures from a plane. The sensor made practical the rapid preparation of temperature maps.

Areas Covered

On July 1, 1969, the East Coast program of obtaining monthly sea-surface temperatures was transferred from the Marine Laboratory of the Bureau of Sport Fisheries and Wildlife (BSFW) at Sandy Hook, N. J., to the Coast Guard's Oceanographic Unit in Washington, D. C.

On the West Coast, similar flights are made from BSFW's laboratory in Tiburon, Calif.

Monthly flights along the East Coast are made between Cape Cod, Mass., and Miami, Fla.; along the West Coast, between Vancouver Islands, B.C., and Northern Baja California, Mexico.

Charts are issued after each series of flights and depict the flight paths and contours of surface isotherms. The data are used in ecologic studies to help explain temperature's

Fig. 1 - Looking through hatch for marine animals. Infrared Thermometer Sensor is to right.

Fig. 2 - Coast Guard team at work.

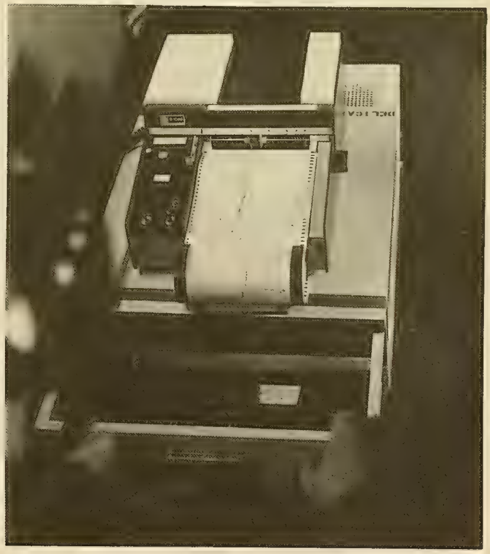
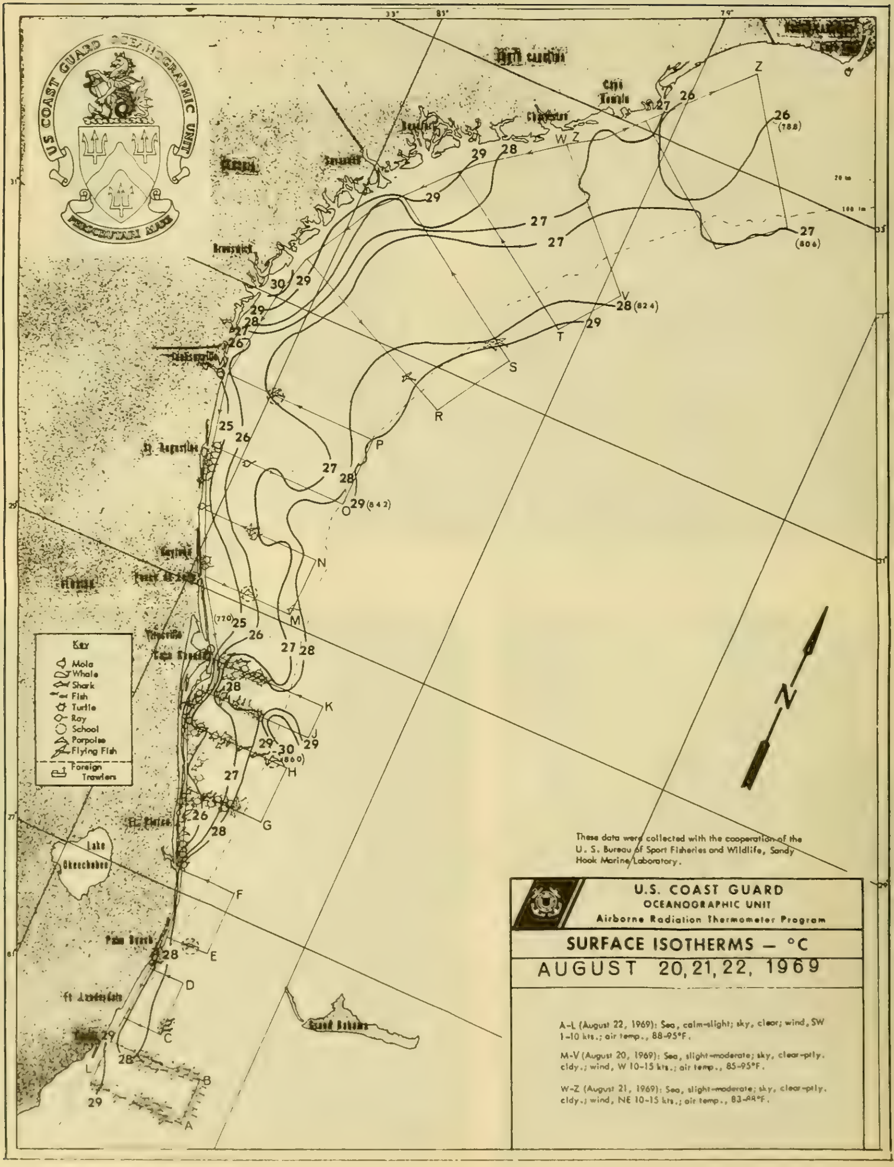


Fig. 3 - Strip Chart Recorder for Infrared Thermometer Readout. (All Photos: Coast Guard)


US COAST GUARD OCEANOGRAPHIC UNIT
Key
Mola
Whale
Shark
Fish
Turtle
Ray
School
Porpoise
Flying Fish
Foreign Trawlers
Lake Okeechobee
These data were collected with the cooperation of the U. S. Bureau of Sport Fisheries and Wildlife, Sandy Hook Marine Laboratory.
U.S. COAST GUARD
OCEANOGRAPHIC UNIT
Airborne Radiation Thermometer Program
SURFACE ISOTHERMS — °C
AUGUST 20, 21, 22, 1969
A-L (August 22, 1969): Sea, calm-slight; sky, clear; wind, SW 1-10 kts.; air temp., 88-95°F.
M-V (August 20, 1969): Sea, slight-moderate; sky, clear-ptly. cldy.; wind, W 10-15 kts.; air temp., 85-95°F.
W-Z (August 21, 1969): Sea, slight-moderate; sky, clear-ptly. cldy.; wind, NE 10-15 kts.; air temp., 83-88°F.

influence on distribution of migratory fishes--and on seasonal cycles of ocean productivity.

The charts are sent to hundreds of private and government institutions, newspapers, and commercial and sport fishermen.

Sightings of Marine Life

During East Coast flights, the crew reports and photographs sharks, turtles, porpoises, whales, and foreign fishing vessels. These are shown on the charts. Occasionally, scientists who are expert in recognizing marine life from the air are aboard. They increase the biological information obtained.

SOVIET RESEARCH VESSEL ARRIVES AT WOODS HOLE

The Soviet research vessel 'Ekliptika' arrived at Woods Hole, Mass., September 28, 1969. Research this year includes a study of herring spawning.

Chief Scientist is Vladimir Sauskan, expert on the life history of Atlantic hake. He has studied various species of Merluccius throughout North and South Atlantic.

The first cruise has been successfully completed. It was a 3-vessel operation; the Soviet 'Aliot' joined in the work at Sauskan's request. The survey cruises were scheduled to end in November.

Atlantniro's 'Ekliptika' leaving Woods Hole (Mass.) Coast Guard Base to join BCF's 'Albatross IV' for a joint survey (September 1969). (Photo: Robert K. Brigham)

FOREIGN FISHING OFF U.S., SEPTEMBER 1969

Generally good weather permitted excellent coverage of the northwest Atlantic off New England; 340 foreign fishing and support vessels were sighted (325 sighted in August). (Fig. 1.)

SOUTHERN NEW ENGLAND & GEORGES BANK

USSR: 75 vessels--34 factory stern trawlers, 126 medium side trawlers, 6 factory base ships, 8 refrigerated transports, and 1 tanker (102 vessels in September 1968). Catches, moderate to heavy, were primarily herring and mackerel.

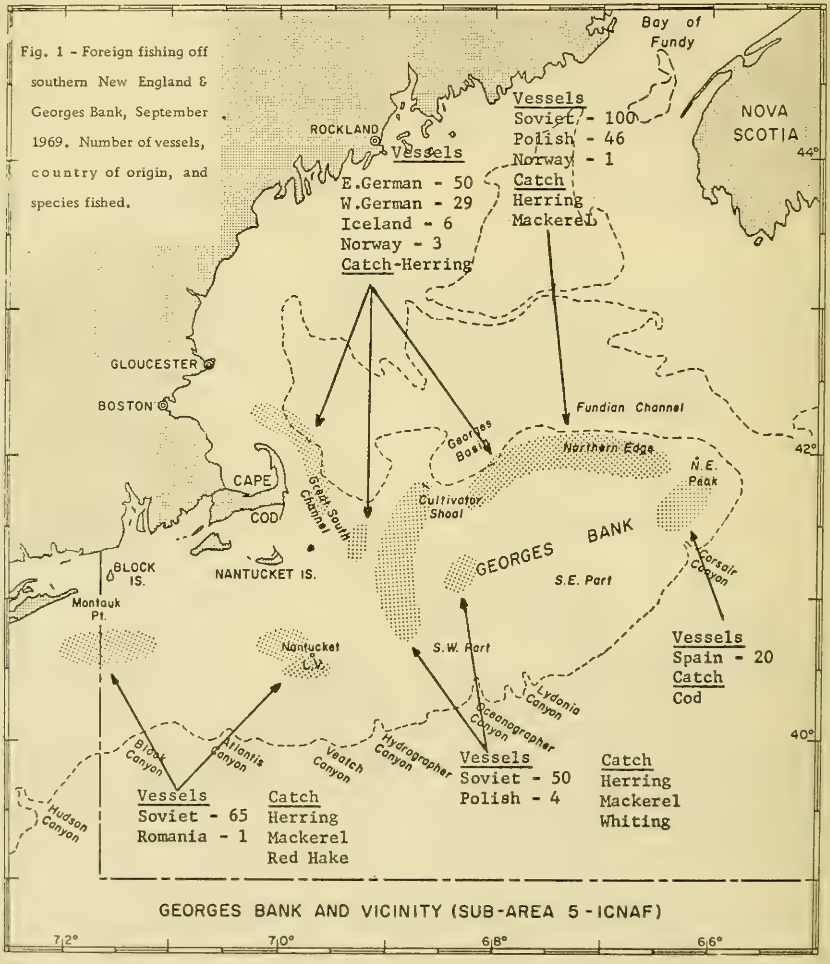


Fig. 1 - Foreign fishing off southern New England & Georges Bank, September 1969. Number of vessels, country of origin, and species fished.

Poland: 50 vessels--13 stern trawlers, 32 large side trawlers, 2 factory base ships, 3 carriers (25 in Sept. 1968). Catches, moderate: herring and mackerel.

East Germany: 50 vessels--29 factory and freezer stern trawlers, 19 side trawlers, 2 factory base ships (20 in 1968). Catches, moderate to heavy, probably herring.

Floating cod-end and pickup techniques were used: A BCF Agent saw 3 floating cod-end sections buoyed together and containing over 100,000 pounds. Retrieval through stern opening of factory base ship took about 15 minutes.

West Germany: 28 freezer stern trawlers, 1 fisheries protection vessel (21). Catch was mainly herring.

Spain: 15-20 stern and side trawlers were pair trawling. Catches were excellent (probably cod).

Iceland: 6 herring purse seiners continued at-sea transfers to U.S. carriers for delivery to reduction plants at Gloucester, Mass., and Amagansett, L.I.

Norway: 1 stern trawler, 3 herring purse seiners.

Romania: 1 stern trawler. Catch was presumably herring and mackerel. (Same trawler, 'Galati,' sighted in September 1968.)

Japan: 1 stern trawler.

GULF OF MEXICO & SOUTH ATLANTIC

No foreign fishing vessels reported.

WEST COAST

USSR: 3 stern trawlers, 6 support vessels, 2 research vessels off Washington and Oregon, and adjacent to Canadian coast off Vancouver Island (33 in September 1968). Catch: Pacific hake. Several hauls estimated at 10,000-35,000 pounds were observed off Washington.

Japan: Early in month, 1 longliner off Washington, and 1 stern trawler off Oregon. Late in month, 2 longliners, 1 stern and 1 side trawler (1 longliner in 1968). Longliners believed fishing black cod.

OFF ALASKA

USSR: 17 vessels (5 more than in each of 2 preceding months, half number sighted in September 1968). (Fig. 2.)

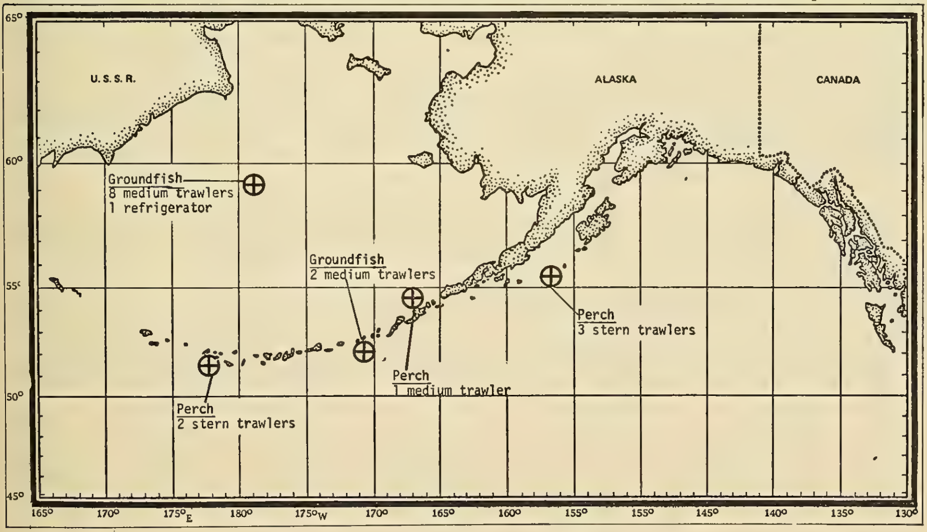


Fig. 2 - Soviet fishing activities off Alaska, September 1969.

Japan: 110 vessels at end of September (190 in August).

Ocean perch: In Gulf of Alaska, about 15 stern trawlers till mid-month; at month's end, 6 were between eastern and central Gulf. Off Aleutians, stern trawlers decreased from 6 to 5--3 south of eastern Aleutians, 2 along western.

Groundfish: Early in month, 12 stern trawlers along Continental Shelf edge in Bering Sea; end of month, 6: 3 in eastern Bering, northwest of Unimak Pass, 3 in central Bering, northwest of Pribilofs.

Minced fish-meat, meal and oil: 5 factoryship fleets fishing Alaska pollock and flatfish, decreased to 3: 2 in central Bering, north of Pribilofs, 1 in eastern Bering, north of Unimak Pass.

The 2 crab fishing fleets departed the eastern Bering Sea after mid-month.

Sablefish: 8 longliners in August; 9 in September--6 in eastern and 3 in central Gulf.

South Korea: Shin Hung's trawling fleet--1 factoryship, 1 carrier, 7 trawlers--left by September 1. One large and 2 small stern trawlers in eastern Bering Sea also believed to have left. Late in month, a new stern trawler appeared in eastern Bering and began trawling groundfish, primarily Alaska pollock.

WHAT DOES THE SEA FLOOR LOOK LIKE?

The sea bottom is divided into three distinct areas: the continental shelf, the contimental slope, and the ocean floor.

The continental shelf has numerous hills, ridges, terraces, and even canyons comparable to the Grand Canyon. The average width of the shelf is about 30 miles, but it may extend several hundred miles from shore. The continental slope, between the shelf and the deep ocean, has an average slope of 2 to 3 degrees, although the slope off a volcanic island may be as much as 50 degrees.

Features of the ocean bottom are comparable to those on land. Many mountains under the sea are higher than Mt. Everest. All oceans except the North Pacific are divided by an almost continuous system of mountains, the largest being the Mid-Atlantic Ridge.

Most of the deep-ocean floor is made up of basins surrounded by walls of lesser depth. Oceanographers have compared the floor of the Pacific to the surface of the moon.

Deep trenches rim the Pacific in areas associated with great volanic activity and lie near islands and continental slopes. The deepest known trenches are in the Western Pacific.

Scientists once believed that the ocean floor was covered by a layer of recently deposited sediments, but it is now known that sediments deposited 100 million years ago lie near the surface of the ocean floor and in some areas are even exposed. ("Questions About The Oceans," U.S. Naval Oceanographic Office.)

STATES

ALASKA

1969 SALMON PACK IS NEARLY MILLION CASES BELOW 1968's

The Alaska Department of Fish and Game reported in September:

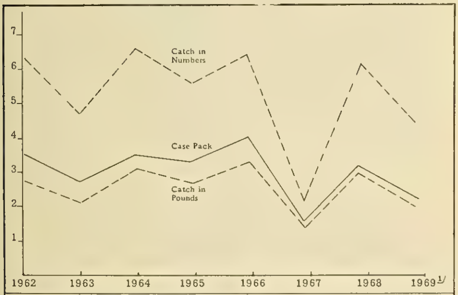
"The 1969 salmon season is basically over now. The preliminary final case pack for this year by region in number of cases is as follows:

	Kings	Reds	Cohoes	Pinks	Chums	Total
Southeastern	302	35,497	8,824	231,105	32,705	308,433
Central.	6,106	311,605	13,723	992,286	123,146	1,446,866
Western	28,584	440,276	1,793	33	26,037	496,723
Total	34,992	787,378	24,340	1,223,424	181,388	2,252,022

"This year's salmon pack was nearly a million cases below that of the 1968 season. A total of 2.2 million 48-pound cases was packed in 1969 compared to 3.1 million cases in 1968. As shown by the graph the pack in 1967 was 1.5 million cases.

"The extremely poor season in Southeastern accounted for practically all of the deficit. The Panhandle catch produced 308,433 cases compared to 1.4 million in 1968.

"Central Alaska's catch produced 1.4 million cases in both 1968 and 1969 while Western Alaska showed an improvement of 138,000 cases over last year.



1/Preliminary.
Notes: Salmon in numbers expressed in 10 millions.
Salmon in pounds expressed in 100 millions.
Salmon in No. of cases expressed in millions.
Source: Compiled by Statistics Section.

1962-1969 Comparative Salmon Statistics.

"The Department each year publishes a weekly Salmon Case Pack by geographical area. Just what does this weekly case pack represent? For one thing over a seven year average the pounds of salmon producing the case pack represented 78% of the total production poundage.

"The graph shows the number of cases of salmon packed, the total catch in numbers of salmon and the total pounds over the years 1962 to 1969. By using this information and knowing what the weekly case pack is at any time during the fishing season, a person can quite easily estimate salmon caught to date either in number or pounds. Sometimes a picture is truly worth 10,000 words."

* * *

LARGEST BRISTOL BAY RUN PREDICTED FOR 1970

The largest salmon catch in the history of the Bristol Bay fishery is in prospect for 1970. This was the preliminary forecast in late September by the Alaska Department of Fish and Game in Juneau.

The inshore run forecast in Bristol Bay sees about 64 million sockeye salmon returning; over 40 million of these should be harvested by fishermen. However, some indicators estimate inshore returns as low as 50 million--a yield similar in size to the parent year 1965.

Maybe Over 5,000,000 Cases

A 40-50 million catch would far exceed the historic highs of 1917, 1938, and 1965, when sockeye catches ranged from 24 to 25 million. The case pack from such a catch, plus relatively good prospects for pink salmon in 1970 throughout Gulf of Alaska districts, should result in highest pack in more than 20 years. It may exceed 5 million cases.

Processing Problems Foreseen

Although more than enough fishermen live and work in Alaska to harvest the expected 1970 bonanza in Bristol Bay, processors may have problems handling the catch, Governor Miller emphasized. This is because the run in the Bay is short and the industry physically limited.

1 River System

The huge size of the expected Bristol Bay run is almost solely attributable to a single river system: the Kvichak River-Lake Iliamna-Lake Clark. Over 52 million sockeye of the 64 million run will return to this watershed, most of these from a single age class of 5-year-olds produced from high-cycle-year spawning in 1965; then, about 25 million escaped the fishery and ascended the river.

High Levels Confirmed

Preliminary indications from high-seas fishing at Adak in 1969 on immature salmon that will make up 1970 run generally confirmed very high levels of abundance. Improved growth rates had occurred compared to parent cycle. The fishing was done by the University of Washington working under U.S. contract.

The 1970 run should require about 14 fish to make a 48-pound case of salmon; in 1965, 17 fish were required.

Other Good Runs

The preliminary forecast for Bristol Bay indicates the Naknek, Egegik, and Ugashik Rivers also will have relatively good runs in 1970. The resident fishermen, especially of Ugashik, recently suffered a series of very poor runs.

* * *

FISHERY ECONOMICS HAS SOME BRIGHT SPOTS

Several reports have indicated the plight of the Alaska fishermen: a low average annual income that would reduce them to a poverty level if total catch value were distributed evenly among all. In 1967, the value of Alaska's catch, $48.8 million, divided among 18,172 fishermen would give an average annual gross income of $2,685. After depreciation, expenses, and taxes, most would have lost money.

Recently, Bill Evans, Statistician of BCF Juneau, drew "an altogether different picture for those who are truly fishermen in Alaska."

SE Alaska Troll Fishery

In the Southeast Alaska troll fishery, 22% of the 1,792 so-called trollers caught 76.4% of the fish. Evans arrived at these figures by going through the list of annual total vessel landings by vessel number. He recorded only trollers catching 1,000 fish or more.

The highliner took 7,000 fish, and the most common (modal) catch for the group was about 2,500 fish. Based on catches of about 25% kings and 75% cohos, the vessel landing 1,000 fish would have grossed about $6,450. The modal annual catch of 2,500 fish would have grossed the fishermen about $16,000; the highliner with 7,000 fish would have grossed about $45,000. Most of these vessels probably fish for halibut also, and perhaps for some other species; so these would have higher annual earnings than indicated from the figures that could easily be obtained.

Central Alaska King Crab

In the Central Alaska king-crab fishery of 222 vessels, only those landing more than 300,000 pounds were counted. Forty-one vessels, 18%, caught 52% of the total 37.3 million pounds. Annual catches for these vessels ranged from 300,000 pounds to 1.5 million pounds; the modal catch was about 500,000 pounds. This would amount to gross earnings for this group ranging from $75,000 to $375,000, with a mode of $125,000.

Evans believes these examples show that many of Alaska's "serious fishermen are making a very good living."

* * *

STATE INSURANCE DIRECTOR URGES FISHERMEN'S CO-OP

Alaska's State Insurance Director, W. W. Fritz, testifying in September before a Congressional Committee in Kodiak, urged Congress to make available a back-up fund of $2

million to form a fishermen's insurance cooperative in Kodiak. This was reported in the Kodiak 'Mirror'.

Fritz said that the insurance industry has virtually no interest in providing marine insurance to North Pacific fishing vessels because of the high rate of boat disasters and resulting heavy losses to insurance firms.

The fishermen of the North Pacific, for the most part, cannot afford the high and increasing rates of marine insurance coverage. One international requirement for getting marine insurance involves hull stability tests. The stability tests are expensive.

Own Co-Op Needed

Fritz envisions the area's fishermen setting up their own insurance pool through an insurance cooperative and a Board they select. The Board, made up of fishermen, would decide which vessels could belong to the cooperative. He said the fishermen know which are the good and the bad risks. Fishermen rejected by the Board would have to pay the commercial rate to be insured by the cooperative.

Insurance pool cooperatives already have been operating for years in Seattle, Wash.

Fritz said the cooperative would need initially a back-up fund of about $2 million to sustain it against any losses during its first few years. He urged that the first insurance cooperative be organized in Kodiak. This one would help set up similar cooperatives in such areas as Bristol Bay and Cook Inlet.

* * *

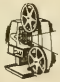
BCF HELPS COUSTEAU
PREPARE SALMON FILM

In early August, scientists of BCF's Auke Bay (Alaska) Laboratory aided the 6-man crew of Jacques Yves-Cousteau's 'Calypso' in production of a film on sockeye salmon. Two Kodiak Island bases were used: the BCF station at Karluk Lake, and the Fraser Lake station of the Alaska Department of Fish and Game. A small part was made in a salmon cannery at Alitak Bay.

Part of Life Cycle

The film covers that part of the salmon's life cycle dealing with the adult's return to the spawning grounds. It includes the fishery, morphological changes in adult fish prior to and after spawning, the spawning act, behavior, and death.

It is expected that the film will be ready for distribution to theaters and ABC and BBC TV in about a year.



CALIFORNIA

TO BUILD FIRST STATE-OWNED
CHANNEL CATFISH HATCHERY

California's Wildlife Conservation Board is financing construction of California's first state-owned hatchery for channel catfish. Building of the $1.2-million Imperial Valley Warmwater Hatchery will begin about Jan. 1, 1970, and take a year.

The Hatchery

The hatchery will be on state property 6 miles north of Niland, on east side of Salton Sea, in Imperial County. It will consist of 17 rearing ponds, each 6 feet deep, covering nearly 100 acres; 3 residences, and an administration building including shop, warehouse, office, and ice-storage facilities.

The Department of Fish and Game will take over operation when the hatchery is completed. The Department recommended construction after nearly 4 years of on-site testing.

500,000 A Year

About 500,000 one-half-pound channel catfish will be reared annually. These will be stocked in many suitable Southern California reservoirs and units of the State Water Project. The channel catfish growth rate is exceptionally fast, and the growing season lasts all year.

* * *

TAGGED STURGEON MIGRATE FAR

A green sturgeon tagged in 1967 in San Pablo Bay, Calif., by the California Department of Fish and Game, has been caught by a commercial fisherman in Grays Harbor, Washington. It was one of 25 tagged that year. Two other tags were returned from the same group, one from Santa Cruz, Calif., the other from Astoria, Oregon.

3 from 1954 Tagging

Three tags from a 1954 California tagging program also were recovered far away: one from Astoria, at liberty more than three years; another from the same area after 431 days; the third after 1,067 days in Winchester Bay, Oregon.

This indicates that green sturgeon migrate along the Pacific coast for considerable distances. They are likely to mix with other populations.

NEW YORK

LONG ISLAND SOUND POLLUTION DOUBLES IN DECADE

Two New York Congressmen warned on October 24 that Long Island Sound was becoming more polluted--and that efforts to improve its water quality were becoming less effective. This was reported the next day by Nancy Moran in 'The New York Times'.

Rep. Ogden R. Reid, Westchester County Republican, said: "Long Island Sound is in danger of becoming another Lake Erie. The water is twice as dirty as it was 10 years ago and the pollution is spreading out from the shoreline."

Rep. Lester L. Wolff, Nassau County Democrat, said Congress should create an intergovernmental commission "to stop the piecemeal destruction that is going on now."

Pollution Increases Sharply

The Congressmen had seen the results of a survey released that week by Interior Department's Federal Water Pollution Control Administration (FWPCA). The report showed that the bacteriologic count in L.I. Sound had risen sharply along shorelines.

Russell E. Train, Interior Department's Under Secretary, commented on the survey: "There is clear evidence of deterioration at the western end of the sound. The bad spots are danger signals that give us a chance to save the sound as a whole."

The survey was made in October by Interior Department's 64-foot, laboratory-equipped 'Clean Waters'. Water was sampled at 100 places throughout the sound.

Sewage Treatment Lags

Most pollution, the survey found, came from the discharges of 179 municipal sewage facilities into the sound--and from commercial navigation, pleasure boats, and dredging. There are 10 times more pleasure boats than 10 years ago.

Less than half the municipal sewage facilities provide secondary disinfecting treatment. Under U.S. regulations, all municipal facilities are slated to have secondary treatment by 1972. Some are behind schedule.

Nuclear Plants Planned

Water quality may be affected significantly by planned construction in the 1970s of 5 nuclear-fueled power plants in the area. The plants would use billions of gallons of water a day for cooling. The hot water discharged into L.I. Sound would cause an almost immediate change in water temperature.

Conservationists oppose the plants because warming of water disrupts fish life. It also fosters growth of algae--from mild green fuzz to huge seaweed-like plants that now are harming Lake Erie.

Effect on Shellfish

The Clean Waters cruised up and back 30 miles, from Port Chester to Flushing Harbor, through murky water. Most of this water has been closed to shellfish harvesting in recent years because of high bacterial counts.

Daniel Marchishin, a sanitary engineer who had gathered water samples, reported many people shellfishing. He said: "We're not policemen, so we let them alone, but I sure wouldn't want to eat those clams."

He and 2 assistants sampled for coliform, rod-shaped bacteria found in the intestines

of warm-blooded animals. At Whitestone Bridge, coliform count was 27,000 per 100 milliliters; at Port Chester Harbor, 14,000 per 100 milliliters. In shellfish areas, 70 per 100 milliliters is standard count.

Coliform counts midstream in the sound and east of Port Jefferson generally were much lower; the water was of "generally good quality."

FWPCA Survey in 1972

The Federal Water Pollution Control Administration plans a comprehensive survey of L.I. Sound in 1972. But, Cong. Reid said, "the pollution problem is growing every day" and the FWPCA survey should begin immediately.

WASHINGTON

HAKE LANDINGS IN PUGET SOUND REACH 9 MILLION POUNDS

Hake landings in Puget Sound during the past season were about 9 million pounds. Chances for a record disappeared when 2 major buyers of hake restricted landings or stopped buying.

A new, floating, fish-meal plant at Neah Bay, Wash., suffered mechanical problems from the time it opened in Nov. 1968. It was forced to limit landings until late March 1969, when it closed for major repairs.

Million-Pound Vessels

Five of the 6 vessels in the 1968-1969 fishery landed over 1,000,000 pounds each; 2 exceeded 2,000,000 pounds. Catch rates for the 6 were higher than in 1967-1968--but the significance of this is uncertain because trawler efficiency differed.

FLORIDA

SHRIMP FARMING STUDY WINS EDA FUNDS

The Economic Development Administration (EDA) has granted $180,759 to a firm to help determine the feasibility of raising fresh-water shrimp on Florida Indian reservations and other underdeveloped lands. The shrimp is the Macrobrachium species indigenous to Florida.

The funds will help pay for a 2-year project of growing fresh-water shrimp in a controlled environment--and demonstrating shrimp cultivation on a semicommercial scale. The study will be conducted on the Big Cypress Reservation in Broward and Hendry counties, about 65 miles northwest of Miami. The Seminole Indian Tribe is leasing the land.

Could Help Indians

The firm says that if fresh-water shrimp farming proves feasible, there would be jobs for Indians on whose reservations the shrimp would be raised. Techniques developed would be adaptable to other parts of the U.S.

Facilities and technical help will be provided by the Bureau of Indian Affairs and Bureau of Commercial Fisheries, Interior Department, Florida Soil Conservation Service of the U.S. Department of Agriculture, and by the Florida Game and Fresh Water Fish Commission. Total cost is $334,290.

EDA

EDA was established under the Public Works and Economic Development Act. It is authorized to conduct the research that will help to create new jobs and boost incomes in areas with employment problems.

COMMONWEALTH OF PUERTO RICO

'STAHL' FINDS SNAPPERS & GROUPERS IN UNEXPLOITED AREA OFF PUERTO RICO

Large red snapper, lane snapper, and grouper are available in an area not generally exploited by local fishermen. The area is Vega Baja to Cerro Gordo. This was discovered in September during exploration and test fishing by the M/V 'Agustin Stahl' of Puerto Rico's Department of Agriculture.

Fishing Tests

The Stahl conducted fishing tests in various depths up to 110 fathoms with fish pots. The results were lane snapper, red snapper (up to 10 pounds each), and grouper.

Local fishermen normally do not use fish pots in this area. The test results may encourage their use. Stahl personnel are helping fishermen build and operate the pots.

A TRAWLER'S VOYAGE POINTS UP U.S. FISHERMEN'S PROBLEMS

Elliot Carlson

HAMPTON, VA.--Old and weather-beaten, the trawler 'Dragnet' slips almost unnoticed into this fishing port. Despite five tough days at sea, the crew of this 35-ton boat shows no elation at the sight of land. For the trip, in the argot of ocean-going fishermen, was nearly a "broker." There was barely enough money made to cover expenses, leaving little for the crew.

The problems were many: Too much time spent chasing too few fish. Mechanical mishaps. Bad weather that cut short the voyage. And, most depressing of all, an unexpected sharp drop in the price of flounder--for which the men were fishing eight miles off the Virginia coast.

"Many more trips like this one and we'll be out of business," grumbles Capt. James Callis, the pipe-smoking, 47-year-old skipper and part-owner of the Dragnet.

"Captain Jimmy" and his two hands aboard the Dragnet aren't alone in their troubles. Indeed, unproductive trips like this one are becoming all too familiar for many American deep-sea fishermen. For one thing, once-prolific species are dwindling. North Atlantic waters no longer yield the rich catches of cod, haddock and ocean perch of just a few years ago. Farther south, catches of porgy, sea bass and flounder have slumped. In Pacific Northwest waters, halibut and king crab are in short supply. The result: America's total fish catch last year was the second smallest since 1942.

FOREIGN RIVALS

Fishermen blame their woes on Russian ships and other foreign fleets that increasingly work waters near the American 12-mile limit. The problem may worsen. Two weeks ago a foreign fleet of more than 300 boats, at least 200 of them flying the Soviet flag, was reported sweeping the New England coast.

Of course, by no means are all species on the decline. The 1968 shrimp catch set a record, and the tuna catch, while down, remained at a high level. Still, concern is heightening over the plight of the U.S. fishing industry, which pulled in $472 million worth of fish in 1968. "Large portions of the industry are in deep trouble," says Lee J. Weddig, executive director of the National Fisheries Institute Inc., a trade group. "The catch is declining, equipment is lagging and there are few, if any, profits."

Much of the American fishing fleet is old, inefficient and unable to compete with the large, modern craft in foreign fleets, which are capable of operating thousands of miles from home ports. There are, to be sure, exceptions; at least 350 new vessels joined the U.S. shrimp fleet last year. But noting that 60% of America's boats are over 16 years old, a Bureau of Commercial Fisheries report states flatly: "Most of the U.S. fleet is obsolete."

RUGGED INDIVIDUALISTS

What's more, foreign boats, often subsidized by their governments, are geared to cooperate in their expeditions. The large Russian fleets regularly send out scout boats that search for schools of fish. American captains, however, tend to be small businessmen who view each other as competitors. Crusty and independent, they aren't inclined to cooperate. And like many small businessmen, they're also plagued by rising costs, especially for labor and insurance.

Whatever the reasons, the U.S. is rapidly losing its place as a world fishing leader. The U.S. share of the total world catch of fish has dropped to 5% from 13% in 1956, thereby moving the nation to sixth from second place (Peru is first). And while America's annual production has varied little since 1945, the world catch of fish has increased more than threefold. The U.S. now imports nearly three-fourths of the fish it consumes.

A Congressional committee that studied the predicament of the fishing industry

This article appeared in the 'Wall Street Journal,' Sept. 29, 1969.

recently commented that "vessels generally become much less economical to operate by the time they are 15 years old." A case in point is the 31-year-old Dragnet, whose mechanical woes add considerably to expenses. "Something is always falling apart," sighs Capt. Callis, a slightly built, unflappable man who has skippered the boat for 15 years.

CATCHING AN ANCHOR

A few days aboard the 65-foot trawler illustrate what the captain means. The first day out the boat's nets were badly shredded when she snagged an old ship's anchor. It took the captain and his two-man crew three hours to disentangle the anchor and repair the net, a delay that cost the men at least one net-load of fish. On the second day, a vital link holding the net to a cable snapped loose, permitting the net to dangle freely in the water. It took an hour to fix and probably cost another haul. (Actually, the boat got off easy this trip; a few months ago she had to be towed home when a propeller was damaged.)

Finally, the weather--a constant worry to fishermen--forced the Dragnet to shorten her trip by two days. But it's unlikely that the extra days at sea would have greatly improved the Dragnet's fortunes. For while the fishing wasn't disastrous, it was mediocre. "I'm not so much disappointed as bored," muttered the captain as he bent over the wheel on the second day. "Ten years ago you could catch twice the fish in half the time."

Capt. Callis and his crew work 14 hours a day, from first light at 5 a.m. to 9 p.m. How do they spend the late evening hours? They fish--this time for themselves, dangling lines over the boat's side. Usually they have even worse luck than during the day: On this trip they caught nothing in two nights of trying. "We just like to fish," said deck hand Garland Smith, baiting a hook with a piece of raw fish.

During the day, the trawler usually has time for seven hauls--assuming nothing breaks down--as she cruises back and forth off the Virginia coast. The nets cut a 60-foot swath along the ocean floor; after covering about two miles, they're hauled in with winches. Each haul yields roughly 70 to 150 pounds of fish.

All told, the Dragnet must haul in about 4,500 pounds of flounder on each trip for the captain and crew to make a modest profit. This is based on prices to the fishermen ranging between 30 and 60 cents a pound, depending on the size of the fish. But on this trip, the catch was only 3,000 pounds, and prices--for reasons that still aren't clear to Capt. Callis--slumped to an average of 27 cents a pound. (The wholesaler who bought the Dragnet's load claims prices always drop after the summer.)

"That was a real blow," says the skipper, noting the boat grossed only about $800 for the five-day effort. The amount was so small it couldn't be divided up in the usual manner, which calls for 40% to be set aside for boat upkeep, 10% to go to the captain and his fellow owners, about $350 to defray expenses and the rest to go to the crew (which again includes the captain). Almost nothing would have been left for the crew had the captain followed this formula, so he juggled expenses so that each man got $100 for about 70 hours work.

Capt. Callis concedes this is low pay, but he has troubles of his own. For the owners to break even each year, he has to gross a minimum of $50,000. This isn't always easy. Last year, for example, the Dragnet's 13-year-old engine broke down, idling the boat for three months. As a result, the captain showed a slight loss for the year. Despite declining catches, it's still possible to make a profit most years because the prices of many dwindling species have doubled or better over the last five years, the skipper says.

Even so, the skipper finds himself caught in a profit squeeze. Higher prices may enable him to gross about what he could when fish were more abundant, but the increases in costs cut profits. For one thing, insurance for his boat and crew now costs him $6,200 annually, up from about $3,000 ten years ago. The costs of fuel, ice, nets, cable and other equipment are also rising.

While he can survive for the moment, the captain worries about the future. "Prices have gone about as high as they can go," he maintains. "So if the fish keep declining, I don't know what's going to happen."

PROPOSALS FOR CURES

Government and industry sources believe Capt. Callis' troubles are typical (the 35-ton

Dragnet may seem small, but only 13,000 of the country's 84,200 commercial fishing boats weigh five tons or more). Lately, dozens of proposals have been advanced for revitalizing the fishing industry. Early this year the President's Commission on Marine Sciences, Engineering and Resources recommended, among other things, that the U.S. develop a "technically advanced fishing fleet" and also reduce "excess fishing effort" in order to replenish depleted species.

One cost problem affecting U.S. fishermen stems from a 1793 law requiring that vessels landing fish in U.S. ports be built in this country. Construction costs in the U.S. are about double those elsewhere. A bill to end the restriction has been introduced in the Senate, but it is given little chance of passage.

In 1964, Congress did pass a law granting subsidies covering up to 50% of the cost of new boats built in the U.S. The law expired in June, and a bill to renew it has been passed by the House and is pending in the Senate. But funds for the subsidies have been scarce, and so far only 32 new boats have been built under the program.

Department of Interior officials say they have been somewhat more successful in efforts to ease pressure on over-fished species. A spokesman notes that in 1967 the Russians agreed to refrain from fishing for flounder, porgy and a few other species found to be declining near U.S. shores. Officials say the program is working, but some fishermen claim the Russians frequently ignore the agreement.

Capt. Callis says that early this year his trawler passed within 100 yards of a Russian fishing boat hauling in large amounts of porgy. He says he complained to the Bureau of Commercial Fisheries but found the agency skeptical. "They asked if I could prove the fish were porgy," recalls the captain. "Hell, I've been chasing porgy all my life, I ought to know what they look like."

The captain claims that during the same trip a Russian boat veered towards the Dragnet and nearly rammed it. The incident was reported to the State Department, but nothing came of it, he says. "A lot of those Russian boats just want to hog the bottom--and since they're bigger than we are, there isn't much we can do about it," he grumbles.

The large Russian, Japanese and other foreign fleets that work off American coasts are equipped to haul in many more fish than U.S. boats. For instance, Russian trawlers, which range up to 423 feet in size, are large enough to pull two sets of nets--one dragging the bottom and one dragging at middle depths. This technique enables them to double their catch.

"The Dragnet simply doesn't have the power to pull more than one set of nets," says Capt. Callis. Fishermen also complain that the Russians use a much finer net, which permits them to fish for a number of species simultaneously. (American boats generally fish for just one species at a time.) The Russian trawlers periodically transfer their catches to large mother ships that process, can and refrigerate the fish while still at sea.

A LOW-PRESSURE LIFE

Despite the industry's troubles, most fishermen are reluctant to leave their jobs, although there have been some departures. Nationally, the number of commercial fishermen declined to 136,500 in 1967 from 161,463 in 1950. Only about 45 trawlers now operate out of Hampton, compared with about 100 ten years ago, according to one study.

Captains complain that young people are rejecting the fishing life for softer land-based jobs. But some fishermen say the low-pressure life at sea has its compensations.

"Out here you're your own boss--there aren't all kinds of people standing over you," says deck hand Smith of the Dragnet. Still, he concedes his income is unimpressive. The two Dragnet deck hands say they gross $4,000 to $5,000 a year. They get no overtime pay, no paid vacations and few other fringe benefits.

Nor does the Dragnet offer her crew much in the way of amenities. The only fresh water comes from a small, hand-operated pump in the bow. Hence, everyone foregoes bathing, tooth-brushing and other niceties during what is ordinarily a seven-day trip. The captain and crew sleep in cramped quarters in the bow or in the engine room, which is hot and reeks with diesel fumes. (Indeed, a passenger found his engine room bunk so intolerable he ended up sleeping on the floor of the pilot-house.)

Food on the Dragnet, however, is good and hearty. Mulligan stew, pork chops, hot dogs and beans--and occasionally fish--are standard fare concocted by deck hand Eugene White, 44, who doubles as cook.

TUNA PURSE SEINE FISHERY IN EASTERN TROPICAL ATLANTIC

John P. Wise

Since the 1950's, a surface fishery for tunas has been carried on in the eastern tropical Atlantic, principally in the Gulf of Guinea and southward. The Gulf of Guinea fleet, originally almost all French, has been augmented by a few vessels from other countries in recent years. In 1967, three American seiners made successful trips to the area and, in 1968, eight American and four Canadian seiners fished in the area during the second half of the year with good results.

In addition to the Gulf of Guinea fishery, now carried on most of the year, there is a less important winter-spring pole-and-line fishery by small French "ice boats" from Dakar. This fishery ranges from 5° N. to 20° N., not more than 250 miles from the coast and around the Cape Verde Islands.

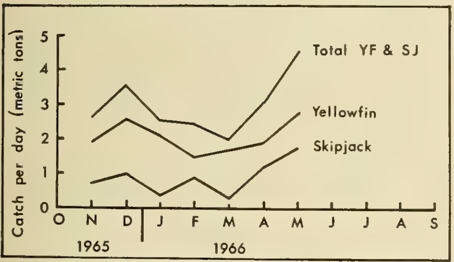


Fig. 1 - Catch per day at sea, Dakar ice boats (1965-66 season).

In the early years of the Gulf of Guinea fishery, almost all of the fishing was done by pole-and-line, but the recent tendency has been for seiners to enter the fishery and for the bait boats to change over to seining. In 1967, seiners made up nearly half of the fleet landing at Pointe-Noire--18 seiners vs. 21 bait boats. (Many of the seiners use live bait to hold the schools while the net is being set.)

The Pointe-Noire fleet, mostly French, concentrates on yellowfin tuna, but there has been a tendency in recent years to land more skipjack tuna. Landings in 1967 and 1968 ran about 85 percent yellowfin, with the remainder almost entirely skipjack. This fleet is supplying a selective market, however, and the landings do not necessarily reflect the distribution of catchable fish. American seiners fishing in the same general areas in 1967 and 1968 landed about 35 percent skipjack.

A clear picture of the distribution of good fishing areas is emerging. This is attributable to the cooperation of the skippers of the U.S. and foreign fleets, and of the French fishery scientists in west Africa who have analyzed the landings data from the fleet that lands at Pointe-Noire. On the basis of the results of the Pointe-Noire fleet in 1967, and the U.S. and Canadian fleets in 1967 and 1968, the best yellowfin tuna seining areas from June to November are:

June	0° - 1° S.	6° - 7° E.
July	1° N. - 1° S.	7° - 9° E.
August	1° N. - 1° S.	4° - 6° E.
	0° - 2° S.	7° - 9° E.
September	1° N. - 2° S.	8° - 9° E.
	0° - 2° S.	7° - 8° E.
	1° S. - 2° S.	5° - 6° E.
	2° S. - 4° S.	7° - 10° E.
	7° S. - 8° S.	11° - 13° E.
October	4° S. - 5° S.	10° - 11° E.
	7° S. - 8° S.	10° - 12° E.
	7° S. - 10° S.	12° - 13° E.
November	7° S. - 9° S.	11° - 12° E.
	7° S. - 11° S.	12° - 13° E.

Abundance of pole-caught yellowfin tuna in the area increases steadily from February until August, then declines again until February. In some years the peak has been in September, or even as late as October.

The author is a fishery biologist with BCF Tropical Atlantic Biological Laboratory, Miami, Florida 33129. Contribution No. 136.

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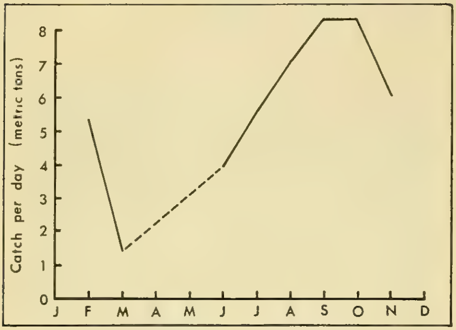

Fig. 2 - Catch per day fishing, seiners landing at Pointe-Noire (1967).

Fig. 3 - Catch per day fishing, live-bait boats landing at Pointe-Noire (1964-67 smoothed average).

A comparison of the good west African fishing areas with the average surface temperatures shows an apparent relation between the areas of good fishing and the 24° C. and 25° C. (roughly 75°-77° F.) isotherms. The relation is consistent with reports of the French researchers at Pointe-Noire (Congo). They have mentioned frequently that the "Berrit Front," identified with the 24° C. isotherm moving from just south of the equator in July to about 13° S. in January, appears to be a concentrating mechanism for tunas.

The Tropical Atlantic Biological Laboratory, a research unit of the Bureau of Commercial Fisheries, has been carrying on studies of tuna biology and oceanography in the eastern tropical Atlantic since 1963. In 1968, the research vessel 'Undaunted' made two cruises to the area (January-May and August-December). We were particularly interested in the distribution and abundance of tuna schools and the relation of tuna to such factors as thermocline depth and water temperature. Some of the information gathered on these cruises is included in this report.

Interest by the U.S. tuna fleet in the eastern tropical Atlantic surface fishery heightened in the summer of 1969. This was due to the closure of the eastern tropical Pacific fishery in mid-April, and the success of U.S. seiners in the Atlantic in 1967 and 1968. As a result, the U.S. fleet operating in the eastern tropical Atlantic increased to over 20 seiners in 1969. Three Panamanian seiners and two Canadian seiners joined the Gulf of Guinea fishery this year. The Japanese government licensed three more purse seiners for the area in early 1969, bringing the total of Japanese seiners in the area to nine. Portugal also is reported to be sending two or three large seiners to the eastern tropical Atlantic.

TABL Data Summary No. 7, which contains more detail on the eastern tropical Atlantic purse seine fishery, is available from the Tropical Atlantic Biological Laboratory, Miami, Florida 33149.

FISHERY OCEANOGRAPHY--IV

OCEAN SALINITY AND DISTRIBUTION OF PACIFIC SALMON

Felix Favorite

Pacific salmon (genus Oncorhynchus) have effective mechanisms for adapting to the osmotic pressures of fresh and salt water, but the significance of salinity on the distribution of salmon is open to question. Young fingerling salmon leaving fresh-water streams and entering the ocean appear able to control their movements so as to permit a gradual acclimatization to oceanic salinities. A fishery biologist studying salmon blood informed me that he routinely placed live adult salmon caught in salt water directly into fresh-water holding tanks without adverse affects. He could thus see no reason why salinity had any bearing on the distribution and migration of salmon in the ocean. Whether any distress was experienced by the salmon, or whether its fresh-water migration had already begun, are beside the point. Salinity, as defined scientifically, is basically determined from measurement of the amount of chloride ion. As such, it has no mysterious characteristics other than degree of concentration. I do not imply that salmon cannot detect small differences in concentration of other ions, but only that salt is salt. However, knowledge of the vertical and horizontal distribution of salinity permits us to ascertain general oceanographic conditions and processes.

Our early investigations (1955-56) were conducted during summer. The salmon were not caught south of the southern boundary of the temperature-minimum stratum described in part 3 of this series of articles. After the 1956 summer season, we were notified that the 'Charles H. Gilbert' of the BCF Honolulu Biological Laboratory had caught four pink salmon (O. gorbuscha) near lat. 41°30' N, long. 165° W in April 1956. The southern boundary of the offshore feeding grounds in the eastern part of the ocean was thereby extended several hundred miles. When sufficient oceanographic data were available, it was possible to show a striking change in the vertical salinity distribution at this latitude (42° N). To the north, salinity increased monotonically with depth, but to the south a salinity-minimum stratum existed at depth. This division was clearly indicated by a vertical 34 ‰ isohaline in the surface layer, which was separate and distinct from the underlying 34 ‰ isohaline (which sloped downward from north to south across this latitude--fig. 1).

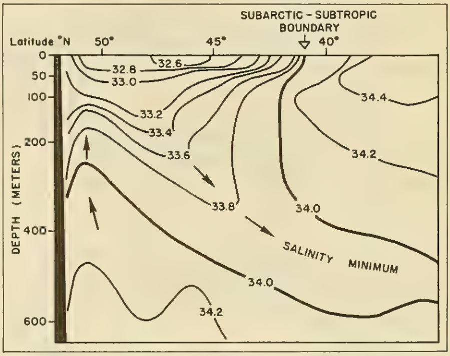

Fig. 1 - Vertical section of salinity in central North Pacific Ocean showing near vertical 34 ‰ isohaline near lat. 41° N, which marks the Subarctic-Subtropic Boundary and the southern limit of Pacific salmon. Arrows indicate probable vertical circulation.

At this point we had three environments: northern, characterized by a temperature-minimum at depth; transition, with monotonically increasing values of temperature and salinity with depth; and southern, characterized by a salinity minimum at depth (fig. 2). For convenience, the first two were subsequently defined as within the Subarctic Region, even though the transition environment should not be considered subarctic because of its occasional high temperatures. The boundary between the transition environment and that having the salinity-minimum stratum is now referred to as the Subarctic-Subtropic Boundary; it has withstood the test of time as the southern limit of the Pacific salmon in the central North Pacific Ocean.

Dr. Favorite is an Oceanographer with BCF's Biological Laboratory, 2725 Montlake Blvd. East, Seattle, Wash. 98102.

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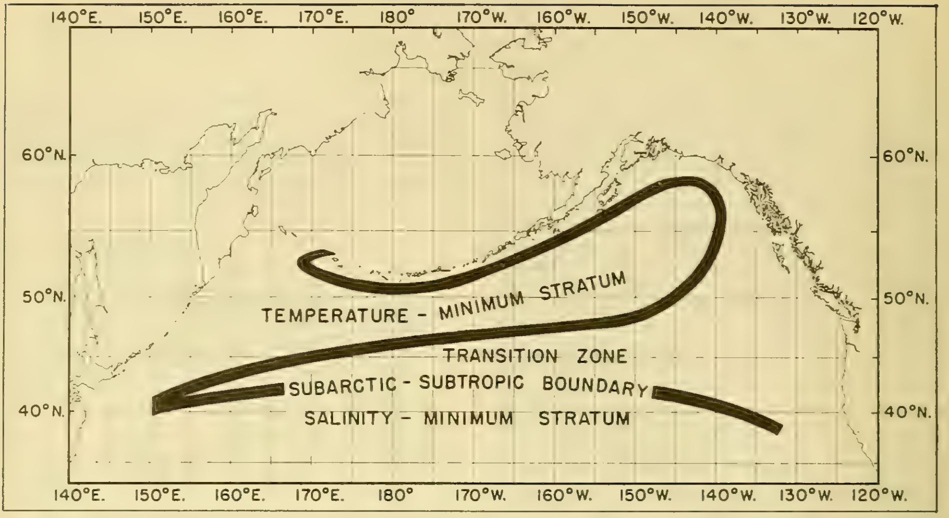

Fig. 2 - Schematic diagram of extent of two salmon environments--one characterized by a subsurface temperature-minimum stratum and the other a transition zone, with neither a temperature- nor salinity-minimum stratum. The Subarctic-Subtropic Boundary denotes the southern limit of Pacific salmon in the open ocean.

The location of the Subarctic-Subtropic boundary also was found later to be an area of distinct changes in type and amount of planktonic forms. But no investigation has been made of the tongue-like intrusion of typically subarctic water, which extends as a salinity-minimum stratum south of lat. 40° N under the surface lens of the saline subtropic surface water. A number of years ago, before we were able to conduct winter salmon fishing, I speculated that some salmon might winter in this deep stratum far removed from the winter storms prevalent at the surface. Although we caught enough salmon at the surface at higher latitudes during winter to challenge this hypothesis, we have never caught them in sufficient quantities to establish a winter distribution pattern. Indeed, it would be interesting to investigate the biomass in this stratum during winter.

The distribution of salinity at depth also provides some clue as to cause of the temperature-minimum stratum. A plot of depth at which the 34 ‰ isohaline occurs (fig. 3) indicates that it rises closest to the surface in a plateau-like structure around the temperature-minimum stratum. If we accept the premise of a northward flow of deep or bottom water from the Antarctic region into the North Pacific Ocean, the physical barrier imposed by the boundary of the Gulf of Alaska and Aleutian Islands could deflect this water upward and cause a certain type of water structure. The subsequent formation of a sharp halocline at the interface of the deep saline water, transported upward, and the bottom of the surface layer of dilute water, limit the downward movement of cold but dilute surface water during winter turnover to 100-200 m. depth, and the temperature-minimum stratum occurs.

I am aware that it would be advantageous to characterize stream runoff by specific chemical constituents or ratios of chemical constituents. The chemistry of sea water, however, is infinitely complex. Several years ago, when we established a chemical oceanography section in our Oceanography Program, we made little progress even though we adopted relatively new techniques, such as atomic absorption spectrophotometry. Dr. T. Joyner (a member of our group at that time) measured particulate aluminum in the plume of the Columbia River by this method. He showed that this technique was almost as effective as that of using salinity to define the extent of the plume; however, particle setting rates which affect the horizontal distribution were not considered.

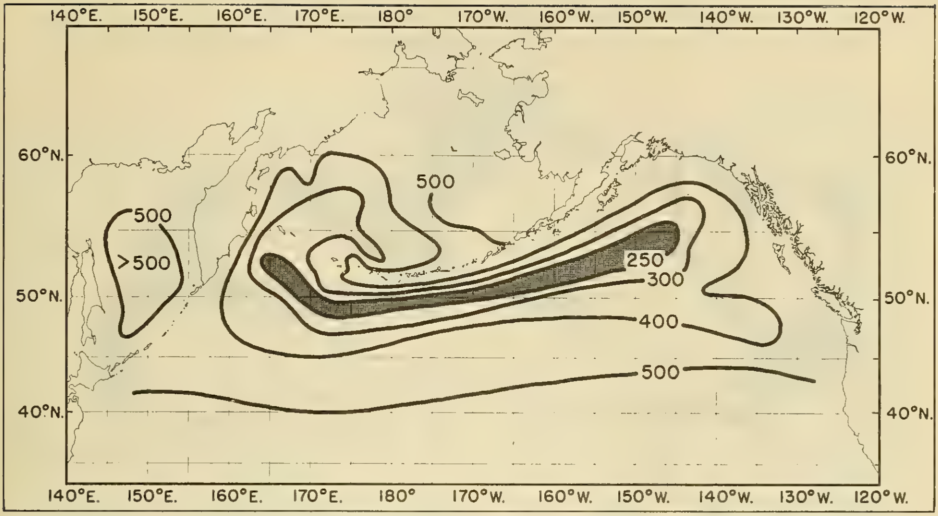

Fig. 3 - Schematic diagram of the depth of 34 ‰ isohaline, showing area of minimum depth (shaded) south of Alaska Peninsula and Aleutian Islands.

That other properties are also advected with the dilute runoff is not extensively documented because most of the elements amenable to analysis at sea are nonconservative--in other words, they are modified by other processes. These properties are primarily nutrients such as phosphate, silicate, or nitrate, which may be consumed by living plants--or replenished by decaying plants and animals as the plume moves seaward. Improvements in chemical analytical techniques for accurate determination of trace elements and other chemical constituents of sea water are sorely needed; such improvements will greatly aid in determining where in the ocean a homing salmon first chemically detects its natal stream, if indeed it ever loses contact.

Surface temperature was not discussed in the previous article because the so-called latitudinal "march" of isotherms, northward in spring and southward in summer as a result of the increasing and decreasing latitude of the sun, is well documented. From ships and satellites, we now obtain data at 5-day intervals on distributions of surface temperature, but no data on distributions of surface salinity. This is unfortunate because the salinities would be more useful than the temperatures in determining flow. Such observations are not made aboard "Ships of Opportunity" (merchant vessels), and remote sensing of salinity is not possible. Equilibration of heat at the sea-air interface and other processes tend to mask advective temperature anomalies, but salinity anomalies in some areas can be traced for great distances.

Surface salinity across the North Pacific Ocean above lat. 45° N is about 33 ‰. At no other place in the world's oceans (except in coastal regions or the Arctic) is there water of such low salinity. At these latitudes in the North Atlantic Ocean, salinity is over 2 ‰ higher (34 ‰ is about the mean value for the surface salinity of the oceans). The Subarctic Pacific Region is characterized by a net precipitation over evaporation. The extensive spring runoff from snowsheds at these latitudes lowers salinity of coastal waters during spring and summer. If we consider the 32.6 ‰ isohaline as indicative of coastal water, we find that it extends over a wide area of the Region (fig. 4).

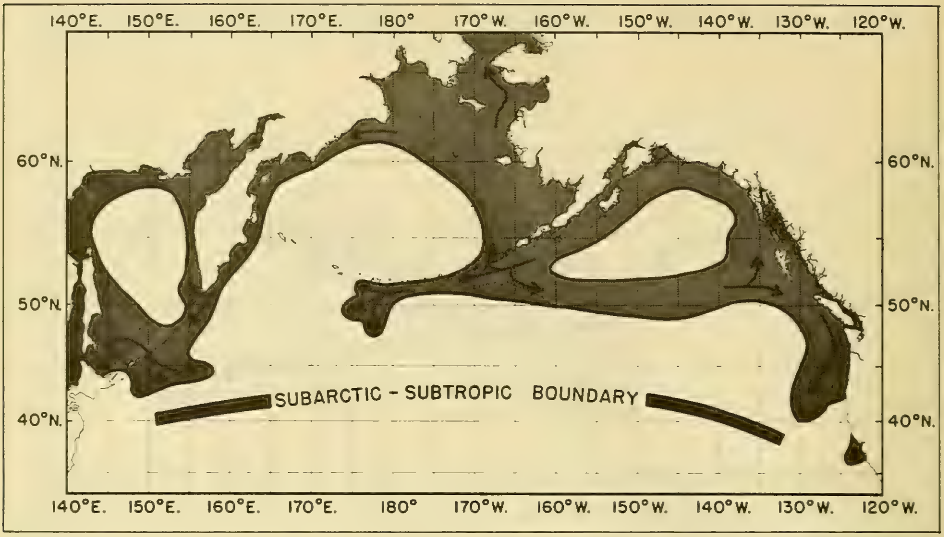

Fig. 4 - Schematic diagram of the seaward extent of the 32.6 ‰ isohaline at the sea surface. Arrows indicate flow suggested by salinity distribution.

The broad continental shelf in the Bering Sea is covered with dilute water from various river runoffs. The absence of any source of deep, saline water (because of the shallow depths) prevents surface salinities in this area from attaining the higher values found in oceanic areas. South of the Bering Sea, it is obvious that dilute water occurs largely inshore of water overlying the temperature-minimum stratum, except where definite intrusions are made into oceanic areas. One location is offshore of the Columbia River, and another is south of the Alaska Peninsula, where a southward intrusion clearly denotes a closed circulation in the Gulf of Alaska. Intrusions at the westward extremity of the Aleutian Islands and on the western North Pacific from the Kuril Island area quickly lose their identity by mixing with more saline oceanic waters; their extents are no longer indicated by surface salinity because of the broad area of rather uniform oceanic salinities. Other characteristics of these two plumes permit us to follow them farther seaward.

In the next article, I shall describe other methods that are used to trace these intrusions of water from the North American and Asian coasts farther into oceanic areas. We shall see how the intrusions appear to influence the ocean distribution of North American and Asian stocks of sockeye salmon (O. nerka).

TROPICAL ATLANTIC TUNA LARVAE COLLECTED DURING EQUALANT SURVEYS

William J. Richards

The EQUALANT surveys, which consisted of multiship oceanic investigations, provided an excellent opportunity to study the tuna larvae of the tropical Atlantic Ocean (considered here to be between lat. 20° N. and lat. 20° S.). The surveys were undertaken as part of the International Cooperative Investigations of the Tropical Atlantic (ICITA).

Dates of the surveys were chosen to coincide with the two oceanographic seasons which occur in these waters--EQUALANT I: February, March, and April 1963; EQUALANT II: August, September, and October 1963. Most of tropical Atlantic is characterized by higher surface temperatures in the northern spring than in the northern summer, but northward from about lat. 10° N. temperatures are higher in the northern summer.

The larvae considered include yellowfin tuna, *Thunnus albacares* (Bonnaterre); bigeye tuna, *T. obesus* Lowe; albacore, *T. alalunga* (Bonnaterre); bluefin tuna, *T. thynnus* (Linnaeus); and skipjack tuna, *Katsuwonus pelamis* (Linnaeus). The principal reason for collection of larval tunas is that their presence in an area is indicative of the recent spawning of adults; thus the date and place of spawning may be inferred from the distribution of the larvae. Besides distribution data, aspects of the relation of the distribution and abundance of the larvae to physical features of the environment were analyzed from temperature and salinity measurements.

Distribution

Total larvae collected for each species studied (EQUALANT survey number in parentheses) were: yellowfin tuna 158 (I), and 209 (II); bigeye tuna 53 (I), and 45 (II); albacore 1 (I); bluefin tuna 3 (I); and skipjack tuna 222 (I) and 181 (II). Distribution charts for yellowfin tuna, bigeye tuna, and skipjack tuna are shown in figures 1, 2, and 3. To facilitate comparisons, the numbers of larvae are expressed as the number occurring beneath 100 m^2 of sea surface area.

Differences in the distribution and relative apparent abundance of the larvae of yellowfin tuna (fig. 1) and bigeye tuna (fig. 2) were striking during EQUALANTS I and II. Both species were concentrated in large numbers off West Africa and scattered off South America in collections made during EQUALANT I; both were more abundant in collections made off South America than in those off West Africa during EQUALANT II. Water temperatures may explain the differences because the two species apparently "prefer" waters above 26° C. Skipjack tuna larvae were abundant throughout most of the tropical Atlantic during both EQUALANT surveys, but absent off Cape Verde during EQUALANT I (fig. 3). Their distribution closely paralleled that of larval yellowfin and bigeye tunas during EQUALANT I, but the latter two species were scarce south of the Equator during EQUALANT II. Apparently skipjack tuna larvae are more tolerant of cool water temperatures than are the larvae of the other species (see below).

Of the two other species of tunas obtained during EQUALANT I, the single albacore larva was collected at lat. 4°30' S., long. 33°30' W., on 5 March. One bluefin tuna larva was caught at lat. 7°56' S., long. 15°27' W., and one at lat. 5°00' S., long. 15°29' W., on 22 March; and one at lat. 6°11' N., long. 13°26' W., on 29 March. Neither species was caught during EQUALANT II.

Temperature and Salinity Relations

Tuna larvae are assumed to be confined predominantly to the mixed surface layer. Comparisons of temperature and salinity values of the mixed surface layer with the distribution of the larvae indicated that only temperature is significant. At most

Dr. Richards is Supervisory Zoologist, BCF Tropical Atlantic Biological Laboratory, 75 Virginia Beach Drive, Miami, Florida 33149.
Contribution No. 133, BCF Tropical Atlantic Biological Laboratory, Miami, Florida 33149.

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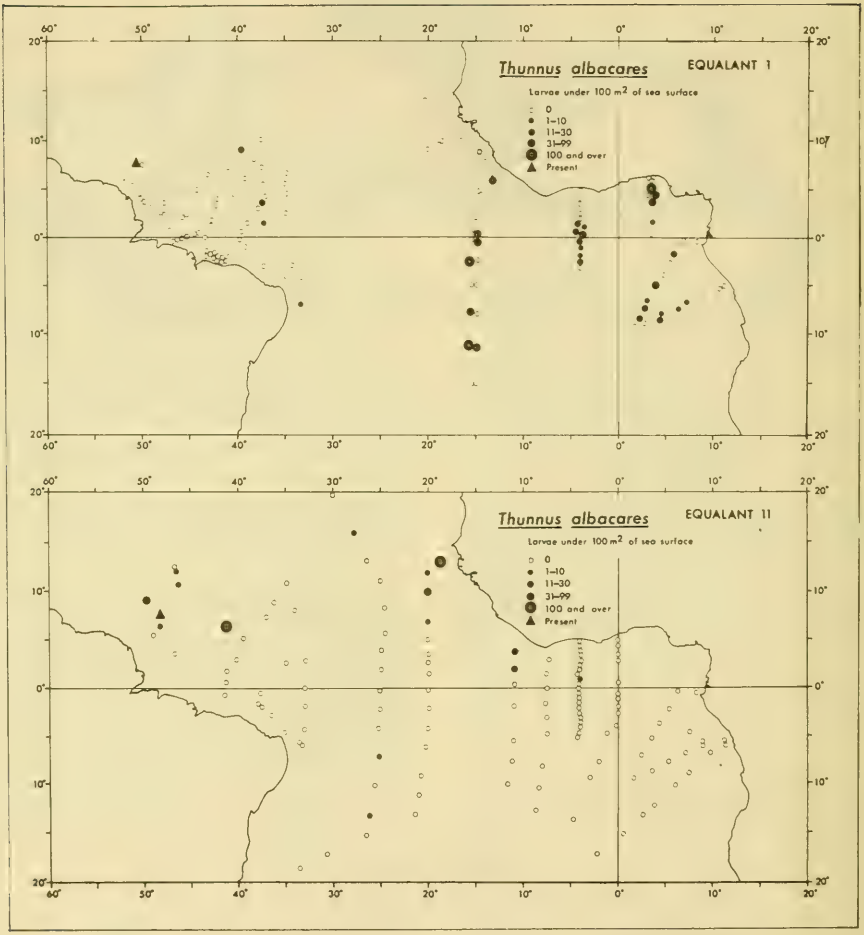

Fig. 1 - Distribution and relative abundance of yellowfin tuna larvae, EQUALANTS I and II.

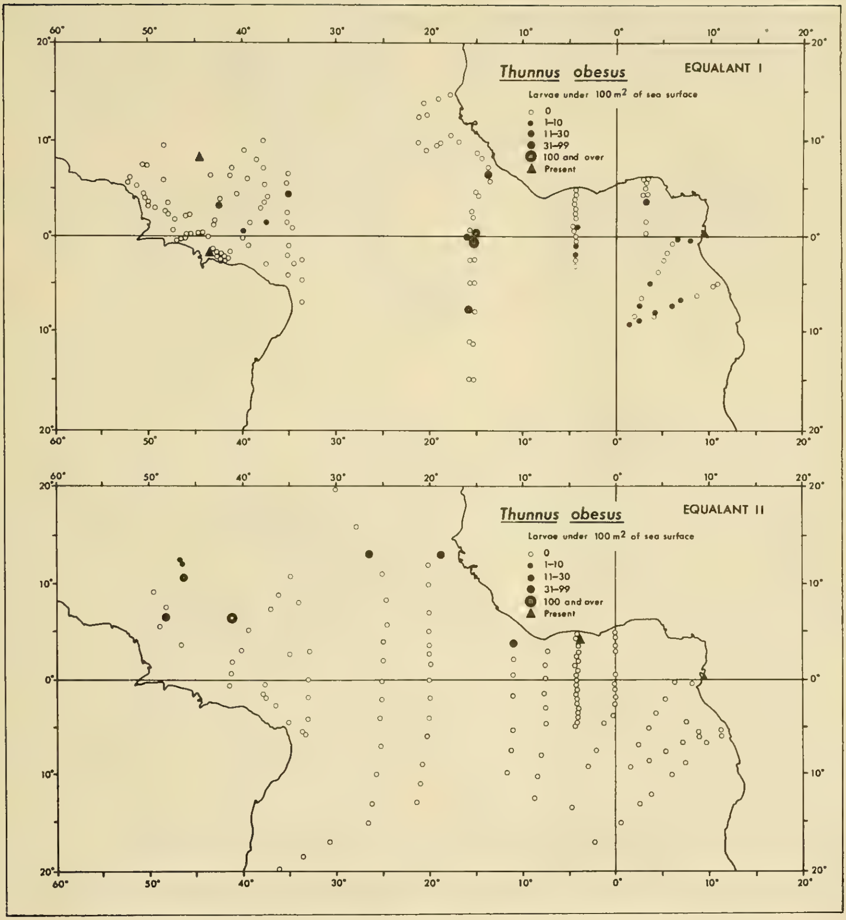

Fig. 2 - Distribution and relative abundance of bigeye tuna larvae, EQUALANTS I and II.

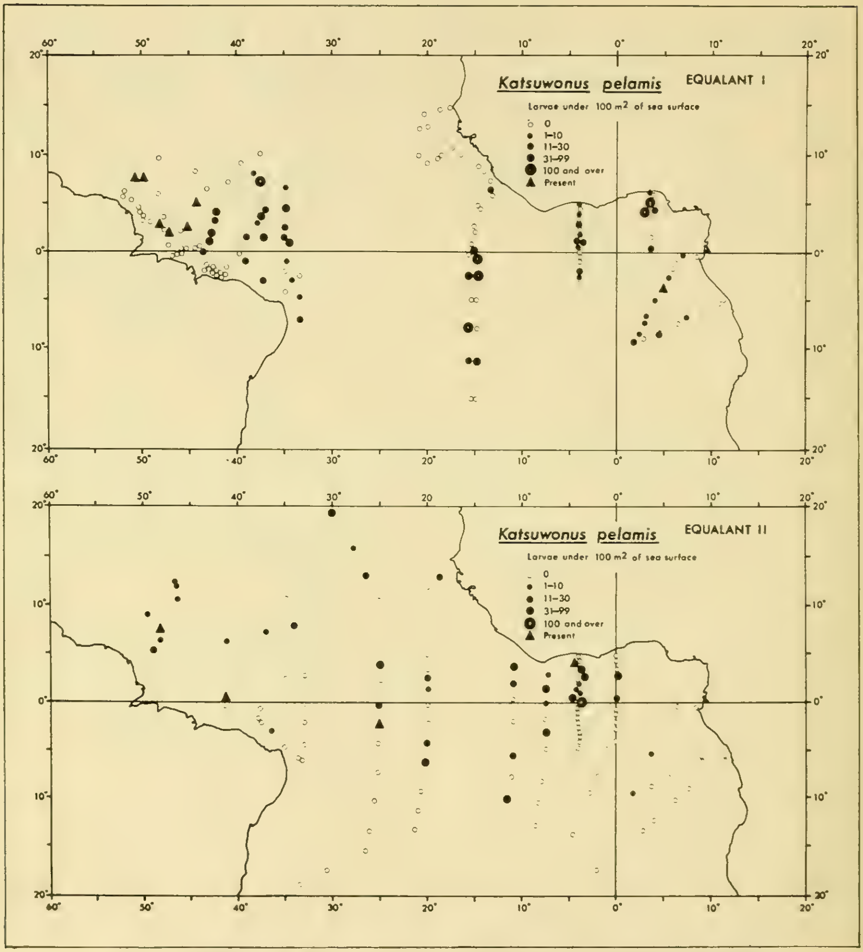

Fig. 3 - Distribution and relative abundance of skipjack tuna larvae, EQUALANTS I and II.

EQUALANT I stations, temperatures were between 26.0° and 29.0° C.; during EQUALANT II they were between 24.0° and 27.5° C. Yellowfin and bigeye tuna larvae were taken only where water temperature was greater than 26.0° C. (26.1° to 29.4° C.). Skipjack tuna larvae were taken only in waters above 26° C. during EQUALANT I (26.1° to 29.4° C.), but in waters both cooler and warmer than 26.0° C. (in nearly equal numbers) during EQUALANT II (23.4° to 27.5° C.).

Conclusion

Larvae of yellowfin, bigeye, and skipjack tunas are widely distributed throughout the tropical Atlantic Ocean. Temperature may be a limiting factor in the spawning or larval survival of yellowfin and bigeye tunas, but apparently skipjack tuna spawn and larvae survive within the limits of water temperature variation in this area.

LITERATURE CITED

RICHARDS, WILLIAM J.
1967. On the distribution and abundance of tuna larvae. Abstract No. 37. Proceedings of the symposium on the oceanography and fisheries resources of the tropical Atlantic. FAO Fish. Rep. No. 51, p. 60.

1969. Distribution and relative apparent abundance of larval tunas collected in the tropical Atlantic during EQUALANT surveys I and II. Proc. Symp. Oceanogr. Fish. Res. Trop. Atl. - Review Papers and Contributions. UNESCO, Paris. pp. 289-315.

WHAT OTHER SEA LIFE IS USED FOR HUMAN CONSUMPTION?

Fish are only one form of marine life used for food. Two other important sources are shellfish and algae. Shellfish are not fish at all; rather, they are members of two large groups of marine animals--crustaceans and mollusks. Lobsters, crabs, and shrimp are the most popular crustaceans on American tables. Spiny lobsters, Alaskan king crabs, and prawns are also harvested for food. Clams, oysters, and scallops are the most commonly eaten mollusks in this country. However, many other mollusks are used in some parts of this country and in other parts of the world. Mussels and cockles are popular in Europe, and squid is popular in Southern Europe and the Orient. Abalone is eaten in the Orient and the Western United States. One noted delicacy of the West Indies is conch salad; conchs are also used in chowder. Still more exotic delicacies are sea urchins and sea cucumbers; these animals are relatives of starfish.

Although not popular in this country, sea mammals provide food for many peoples. Whales provide a great deal of meat which is marketed commercially in Japan and the Scandinavian countries. The Eskimo has depended on seals and walruses for food, oil, fur, and leather for centuries.

Food from the sea is not limited to animal life. Seaweeds have also been used as food for centuries. In Iceland, söl, a red alga, is used as a vegetable during the long winters. Other algae have been boiled and made into puddings. Seaweed is also eaten in the British Isles. The use of seaweed for food is most highly developed in Japan. Nori, a red alga, is cultivated as a crop on nets or bushes set in quiet bays. In the past, Hawaiians have made use of a wide variety of seaweeds, and the most select varieties were grown in special ponds for the nobility.

Kelp, a brown alga, is the raw material for a gelatin used in many food products. The growing world population, coupled with the shortage of protein foods in underdeveloped areas, has stimulated interest in algae as a source of cheap protein. Flour enriched with protein extracts from algae has been used in baked goods. ("Questions About The Oceans," U.S. Naval Oceanographic Office.)

ACOUSTICS

"Underwater Acoustics: Volume 2," edited by V.M. Albers, Plenum Press, New York, 1967, 416 + xiii pp., indexed, illus.

This book is a compilation of lectures presented at the Second Institute on Underwater Acoustics, Copenhagen, 1966. It includes 18 lectures by outstanding scientists, each an authority in his field. The lectures and their bibliographies make the book an invaluable reference.

The subjects include: advanced transducers; underwater sound in marine biology and geology; frequency discrimination in the common seal; sound propagation in the presence of bladder fish; flow noise; sound propagation and ambient noise under ice; sound scattering; underwater sound in oceanography; internal waves, and transmission rates in underwater acoustic telemetry.

ENCYCLOPEDIA OF MARINE RESOURCES

"The Encyclopedia of Marine Resources," edited by Frank E. Firth, Van Nostrand, Princeton, N.J., 1969, 740 + xi pp., indexed, illus., $25.

A handy reference compiled in response to the demand for readily accessible information on rapidly expanding undersea frontier. It covers more than 125 topics of current interest, from abalone to underwater mining; it includes minerals, bio-dynamics, food production, at-sea freezing and processing, fishing gear and equipment, pollution, and farming the sea.

FISHING EFFORT

"The Concept of the Marginal Yield from Exploited Fish Stocks," by J.A. Gulland, article (J. Cons. perm. inte. Explor. Mer., Vol. 32, No. 2, Nov. 1968, pp. 256-61).

When fishing effort increases on an exploited stock, the increase in total yield (the marginal yield) is less than might be estimated from the product of the increase in effort and the catch-per-unit effort. Marginal efficiency is the actual increase percentage of the expected increase. It can be near 100% for very lightly fished stocks, and decrease to near zero, or become even negative, for heavily fished stocks.

Mr. Gulland examines marginal efficiency as a function of catch for 2 commonly used population models. He discusses the implication of the concepts of marginal yield and marginal efficiency for fishery management and for planning fishery development.

OCEANOGRAPHIC RESEARCH

"Oceanographic Ship Operating Schedules," available free from Marine Sciences Affairs Staff, Office of the Oceanographer of the Navy, Bldg. 159E, Rm. 476, Washington Navy Yard, Washington, D. C. 20390.

A list of planned schedules and areas of operation of 79 U.S. Government-owned or sponsored research vessels, and Coast Guard ships at 6 ocean stations, participating in the national marine science program from November 1969 to April 1970. Many are equipped to accommodate visiting scientists and additional instrumentation.

Expected cruise dates, areas, and type of work--fishery research, plankton studies, etc.--are given for each ship. Interested scientists may apply for available berth space directly to agency or institution operating specific ships. Research data obtained during cruises may be obtained from the National Oceanographic Data Center, Bldg. 160, Washington Navy Yard, Washington, D.C. 20390.

PESTICIDES

"Pesticides in Surface Waters of the United States: a Five-Year Summary 1964-1968," by J.J. Lichtenberg, J.W. Eichelberger, R.C. Dressman, and J.E. Longbottom, Department of the Interior, FWPCA, Analytical Quality Control Laboratory, Cincinnati, Ohio, Sept. 1969, 11 pp., 8 tables, illus.

A report on 5 annual synoptic surveys for chlorinated hydrocarbon pesticides showing widespread occurrences of such compounds. The most frequently detected were Dieldrin and DDT, and its close relatives DDE and DDD. The maximum concentrations found did not exceed permissible limits in relation to direct human intake from a domestic water supply--but they often exceeded the environmental limit recommended by the Federal Committee on Water Quality Criteria.

The tables show concentration percentages and their locations.

PRODUCTIVITY OF MAN-MADE LAKES

"Conference on the Ecological Aspects of International Development," by Julia McCaull, article, "Nature and Resources" (bull. of Int. Hydrological Dec.), Vol. 5, No. 2, June 1969, pp. 5-12.

The lack of mechanism for ensuring that the advance of technology brings desirable benefits, not disasters, has been strongly felt in many areas, especially in fisheries.

The biggest, and perhaps the most consequential, hydrological projects are those to control the great rivers of the world. The dangers of instituting such gigantic enterprises without adequate ecological planning is illustrated by the Kariba Dam on the Zambezi, and the high dam at Aswan. This article, a synopsis of conference papers, notes the adverse affects on fishing created by these dams.

Before the formation of Lake Kariba, government officials had predicted it would produce up to 20,000 tons of fish annually. The production did not materialize. In 1963, more than 2,000 fishermen took 4,000 short tons from the lake. In 1964, the yield was less than 2,100 tons and, by 1967, the lake supported only 500 fishermen. This drastic decline apparently was due to only partially understood ecological factors. Some of these are discussed in the article.

The Aswan Dam, which halted the flow of nutrients reaching the ocean, has destroyed the coastal sardine fishing industry. Five delta lakes fished commercially also appear less productive. Although Lake Nasser may produce catches exceeding those lost at the delta, a parallel is drawn between these expectations and the unfulfilled expectations at Lake Kariba.

Mr. McCaull also discusses the slow strangulation of Lake Valencia in Venezuela.

PUBLICATIONS

"Fishery Publications Index, 1955-64," Circular 296, Department of the Interior, Fish & Wildlife Service, May 1969. Sold by Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, $1.75.

This is a list of Fish & Wildlife Service fishery publications indexed by series, authors, and subjects. It includes popular, statistical, and scientific reports.

The following, published by the Fish & Wildlife Service, Department of the Interior, are available from Division of Publications, BCF, 1801 N. Moore Street, Arlington, Va. 22209:

PROCESSING

"Use of Sodium Tripolyphosphate to Control Fish Shrinkage during Hot-Smoking," by H. J. Barnett, R.W. Nelson, and J.A. Dassow, article, 'Fishery Industrial Research,' Vol. 5, No. 3, pp. 103-115, illus.

Moisture loss in hot-smoking (kippering) thawed halibut, salmon, and black cod results in economic loss as well as loss of quality. Because sodium tripolyphosphate effectively reduces loss of moisture in other foods, including fresh fish, it was tried with these smoked products and found effective in halibut and salmon.

The authors describe the procedures and results of their experiments and provide recommendations for industry trials.

SCALLOPS

"Explorations for Calico Scallop, Pecten gibbus, in the Area off Cape Kennedy, Florida, 1960-66," by Shelby B. Drummond, "Fishery Industrial Research," Vol. 5, No. 2, pp. 85-101.

Scallops, long have been considered a gourmet item in the U.S. Both bay and sea scallops are the basis of a thriving industry.

BCF exploratory vessels have discovered an immense, and little fished, bed of calico scallops off the east coast of Florida. The bed, in about 5 to 40 fathoms, covers 5,790 square miles, from about 11 miles south of Stuart, to about 6 miles north of St. Augustine. At the more favorable locations, the supply is adequate to support an almost year-round fishery. The area between Fort Pierce and the southeast shoal of Cape Kennedy was productive most consistently.

The bed is shown in 14 charts; catch rates are given for the entire grounds.

LEVELS OF RADIOACTIVITY IN SEAFOOD

"Consumption Trials and Edible Fractions of Various Commercially Important Species of Fish and Shellfish," by C.J. Barker, article, in J. Cons. perm. int. Explor. Mer., Vol. 32, No. 1, July 1968, pp. 117-22.

Consumption survey data are used to assess maximum permissible discharge rates for aqueous radioactive effluent from nuclear installations. To monitor the levels present in seafood, it is necessary to know the consumption rates for persons in an area, and to convert this into edible fractions.

Consumption survey data are usually in the form of average and maximum numbers, or weight of fish consumed. The figures can be converted to edible material by data from the consumption trials. The relative percentage of edible material in raw whole ungutted fish, or raw filleted fish, is determined.

Mr. Baker describes the methods, procedures, and results of trials on 11 different species.

--Barbara Lundy

WHAT IS BIOLUMINESCENCE?

Bioluminescence is light produced by living organisms, both animals and plants. In contrast to incandescent light, high temperatures are not necessary; oxygen, however, appears to be essential to the light-producing process.

Thousands of species of marine animals produce bioluminescence; most of them are animals of the lower orders. In addition to single-celled animals, various jellyfish and related animals produce displays. Among vertebrates, luminescence is found only in certain fishes and sharks.

Displays are seen most commonly in warm surface waters. Although most of the organisms are small, there are such immense numbers present that brilliant displays occur when the waters are disturbed by the passage of a ship at night.

Luminescent bacteria are present in sea water, but not in fresh water and can cause decaying fish to glow in the dark.

At ocean depths where light does not penetrate, there are strange-looking luminescent fishes. Beebe estimated that 96 percent of all the creatures brought up by nets were luminescent. There is controversy among biologists concerning the purpose of lights on marine animals. Some creatures have well-developed eyes but no light to enable them to see in the dark; others have brilliant light organs but are too blind to see. The property of luminescence is perhaps used as a defense against predators or as a means of hunting food or finding members of the opposite sex in the dark. ("Questions About The Oceans," U.S. Naval Oceanographic Office.)

INTERNATIONAL

FAO HOLDS CONFERENCE TO SPUR FISHERY INVESTMENTS

World-wide action to stimulate capital investment in the fisheries of developing countries was recommended by FAO's International Conference on Investments in Fisheries, held in Rome, September 18-25. About 150 representatives of government, industry, banks, and universities in 42 countries wound up the 6-day meeting calling for national and regional meetings to secure foreign financing for fishery projects in developing countries.

FAO Backing

Roy I. Jackson, FAO Assistant Director-General for Fisheries, promised full support. He said: "Where opportunities for promoting foreign-exchange-earning export industries exist, we would seek to interest private foreign investors, bilateral agencies and banks."

Objectives

Oris V. Wells, FAO Deputy Director-General, stated that in most of the developing countries, for the next decade at least, "the major battle will still be fought on the food front." Despite improvements in the general world food situation, he warned that population increase in the developing world is still between 2.5% and 3% a year.

Wells said that fish can contribute greatly to fulfilling human protein requirements. In many developing countries, it is "the cheapest source of strategic animal protein." In these countries, and in those deriving important foreign-exchange earnings through fish exports, fisheries would be emphasized increasingly in national development programs.

Wells added: "To meet the demand for more fish, for fish of a better quality offered at reasonable prices, investment in fish catching, processing and distribution will have to be expanded. . . . Finance will have to be found for new and improved facilities at sea and on shore, for manpower training, resources, and technological research and development."

Wells expected the conference to go far in identifying investment opportunities and proposing ways and means of exploiting them. It could evaluate techniques to promote improved investment planning, and ensure that scarce development resources were not squandered.

Information Problems

The delegates agreed that private, government, and international capital is available for worthwhile fishery projects, but the question is how to bring capital together. They emphasized lack of information on conditions and opportunities for investment.

To bridge the 'information gap,' it was suggested that FAO organize national and regional meetings as a 'brokerage function' to promote development. FAO already assists industry and agriculture through its investment center, the FAO/Industry Cooperative Program and Legislation Branch.

Clearing House

The delegates also suggested establishment of an 'international clearing house' to pinpoint opportunities and channel investments. Efforts must be made now to collect accurate information on investment opportunities, and scientific data on fishery resources--a prime requisite of good investment planning.

Representatives of international financial institutions stated that private financing was sound business, "not an adventure in altruism." They discussed opportunities for financing by private institutions and joint ventures into fishery enterprises.

Rising Demand for Fish

The delegates agreed that sound opportunities for investment exist. World fisheries are expanding steadily to meet growing food demands. The need for more animal proteins, especially in developing areas, is growing. Consumption is expected to double in the next 20 years. This will assure producers a reliable market. Developing countries recognize fisheries as a potential new source of export earnings.

World Fishery Bank Recommended

Creation of a world fishery bank to finance the industry, particularly in developing

countries, was recommended by B. M. O'Kelley, Chairman, Irish Sea Fisheries Board. He said bank should be part of a government-financed international fishery development corporation. It should be treated as an international industry, utilizing a "total industrial approach." The corporation would collect and disseminate marketing and technological information, and promote investments, particularly in less-developed areas. It would consult on investment problems, assist in identifying and promoting investment opportunities, and provide a "forum where investor and promoter could meet."

The suggestion was a fresh approach to "bridging the gap between the capital exporting countries and those less developed areas of the world where the populations live on the verge of starvation," Kelly said. Unlike industry or agriculture, fishing industry usually has trouble getting capital.

Other Suggestions

Prof. R. H. Barback of the U.K. said his government intends to increase overseas aid when the balance of payments situation improves. The aid would be given on a multilateral rather than a bilateral basis. Canada's L. J. Berube suggested that developing countries establish fishery cooperatives by forming state enterprises and transforming them into cooperatives once the share-owning fishermen acquire majority control.

Opportunities in Developing Countries

Several representatives from developing countries cited investment opportunities in their areas. L. Nhwani, a Tanzanian fishery officer, said his country, with a 500-mile coastline on the Indian Ocean, was fishing only one-tenth its potential. R. B. Williamson, chief fisheries officer of Malawi, noted Lake Nyasa's unexploited fisheries.

Mexico's A. Cervantes Delgado pointed out opportunities in Latin America. Fish is rarely eaten in many areas, despite the 'explosive' fishery development in countries like Peru.

Speakers emphasized need for developing marketing and distribution systems. One African speaker said that building a 20-mile road could mean difference between development and continued stagnation.

Future Plans

FAO intends to follow up the conference's work. It will hold one conference on the use of marginal fishery resources, like those in the Arabian Sea, and another on fishery education and training.

HORMONES STIMULATE FISH GROWTH

Fish culturists have found a new answer to sexual sluggishness in fish: treat them with hormones. Hormones are glandular secretions regulating growth, reproduction, and other vital body functions in humans and animals. Introduced artificially, they act like naturally produced hormones. Dr. T. V. R. Pillay, who heads the Fish Culture Section of FAO's Department of Fisheries, says hormones are used to increase carp production in Taiwan, India, and other Asian countries where carp is commonly grown for food.

Carp

A tasty, nutritious fresh-water fish, carp comes in several species; some of the best known are the Indian and Chinese. An Indian carp, the Catla, grows to about 6 feet and 140 pounds. Carp is a herbivore, hardy, compatible with other fish, and ideal for pond culture.

Spawning

Dr. Pillay points out, however, that Indian and Chinese carp do not spawn in still waters. "They normally spawn only in running water, especially after a heavy rainfall. In countries such as India and Pakistan. . .the Indian carp will breed in the rising waters of the flooding monsoons. In fact, farmers and fishermen in these countries build special ponds to trap the monsoon waters so as to recreate the conditions under which the fish will spawn."

Methods

Seeking an easier method, carp culturists have borrowed from medical knowledge by using hormones, both synthetic and natural, from the carp's pituitary glands.

Dr. Pillay explained: "The hormones are injected with a hypodermic needle into the shoulder or tail region of the fish. Normally,

two or three injections are given, both to male and female members of the species. The hormones stimulate the gland of the fish, inducing sexual maturation and spawning. Before injection, large fish may be treated with a tranquilizer to keep them calm and facilitate handling. The fish are placed in a tank containing water to which a mild tranquilizing chemical has been added. They may be laid in a special cradle to receive the injection.

"Since carp are very prolific--the larger females can lay millions of eggs during each spawning period--it is necessary to breed only a few fish to obtain the necessary number of fry for cultivation. The process is not expensive and adding hormones does not affect the fish's taste in any way."

Other Countries

Dr. Pillay says the process has been developed in a number of countries. In Brazil, it was used to breed local species. Fish culturists in Mainland China also are reported using hormones to stimulate reproduction.

So promising is the practice that FAO recently sponsored a Regional Seminar on Induced Breeding of Cultivated Fishes. The seminar, held in Calcutta, Cuttack, and Bombay, brought together culturists from 12 Asian and Far Eastern countries. Knowledge of hormone use might help boost fish production in those countries.

FRENCH TAG TUNA IN EASTERN ATLANTIC

Scientists aboard the French research vessel 'La Pelagia' tagged albacore, Thunnus alalunga, between 37° and 51° N. latitude and between the Continental Shelf and 20° W. meridian (off western Portugal, Bay of Biscay, and southwest Ireland), from June 5 to October 30.

Plastic and Metal Darts Used

The tags are Floy Tag FT-1 (plastic dart) and WH FM 67 (metal dart). They bear a yellow plastic strip with the words "Institut Pêches Maritimes Paris France-Récompense."

Tag Recovery

All recovered tags should be returned to the Institut Scientifique et Technique des Pêches Maritimes, 59 Avenue Raymond Poincaré, Paris 16, France, with the following information: date and place recaptured, type of fishing, size (from end of snout to the caudal fin), and weight, if possible. Fifteen French francs will be paid for all tagged fish recaptured. (FAO, Aug. 1969.)

3 NATIONS SURVEY BARENTS SEA

Five research vessels--one British, 2 Norwegian, 2 Soviet--sailed on a joint expedition to the Barents Sea in late August. Their mission was to estimate abundance of the 1969 year-classes of cod, ocean perch, and herring in the Barents and northeastern Norwegian Seas; also, to assess the maximum sustainable yield for 1972-76. An oceanographic survey will be carried out in the southwestern Norwegian Sea.

Will Report to ICES

When the surveys have been completed, participating scientists will go to Norway to prepare a report for the International Council for Exploration of the Sea (ICES). (TASS, Aug. 25.)

JAPAN AND SOUTH KOREA PLAN JOINT VENTURE

The Taiyo Fishing Co. of Japan and the Republic of Korea's government-owned Agriculture-Forestry-Fisheries Development Corporation are planning a joint fishery venture in South Korea. A joint company was scheduled to be established around the end of September. Taiyo will furnish the vessels, and the Development Corporation will construct a large processing plant.

Taiyo Trawlers Sought

Reportedly, Taiyo has been asked to provide three 500- to 900-gross-ton bottom trawlers and two 120-ton shrimp trawlers to be manned by South Koreans. They will fish in the Pacific, the North Atlantic, and on shrimp grounds off foreign coasts. ('Minato Shimbun,' Aug. 5.)

PAIR SEINE NETTING PROVES GREAT SUCCESS

News of 5,000-10,000-pound catches of hake and sole in 1 hour has become commonplace around Prince Edward Island. These astounding results have been achieved by an entirely new technique, 'Canadian pair-seine netting.'

Similar to Spanish Pair-Trawling

The technique is similar to the 'pareja' pair trawling commonly used by large Spanish deep-sea trawlers in the north Atlantic. In the Canadian version, 2 110-hp. diesel engine 40-foot lobster boats tow a single net between them. The net is funnel-shaped, somewhat like a regular otter trawl, but with a higher vertical opening. Two winches, one on each boat, haul the net. The skippers, coordinating operations by radiotelephone, can make as many as 8 tows a day.

Inexpensive Conversion

Small-boat fishermen will find two great advantages in the new technique: the machinery and gear needed for vessel commission are relatively inexpensive, and the power requirements are low compared to those of regular draggers. It also will enable lobstermen to use their boats during the many off-season months. Other low-powered inshore vessels also can use the techniques.

A full report, including machinery and gear specifications, and a description of the fishing method with diagrams, photographs, and catch records should be available shortly. (Dept. of Fisheries and Forestry, Sept. 12.)

* * *

FISHERIES MINISTER PROPOSES STRICTER SALMON LICENSING IN BRITISH COLUMBIA

The first phase of a scheme to limit salmon licenses in British Columbia (B.C.) became effective Sept. 6, 1968. It was intended to increase the earning power of salmon fishermen and permit better resource management.

Regulations expected to reduce fleet size and production costs divided B.C. salmon vessels into 3 categories: 'A' for those producing annually over 10,000 pounds, or a

Spanish pareja trawlers harvesting large codfish on easterly side of Georges Bank, Feb. 27, 1968.

CANADA (Contd.):

landed value of C$1,250; 'B,' producing less than 10,000 pounds; and 'C,' mostly for trawlers and crab boats not normally geared to fish salmon.

Fleet Size Cut

By June 15, 1969, the regulations had served to cut the fleet from 7,548 licensed in 1968 to 6,977--5,844 in category 'A,' 1,003 in 'B,' and 100 in 'C'. Net worth of the fleet in 1968 had been $87 million; though smaller in 1969, its value had risen to $95.6 million.

Other Phase I Changes

Under Phase I, the fleet added 255 newly built boats (already under construction on Sept. 6, 1968); 160 vessels that would have been 'A' did not renew their licenses; 70 'A' vessels were retired and replaced with new ones, and replacements were approved for 45 lost at sea.

Proposed Phase II Regulations

On Sept. 3, 1969, the Minister of Fisheries and Forestry, Jack Davis, proposed new regulations for Phase II. Under these, B.C. salmon fishermen would be hard pushed to keep their vessels in category 'A,' license fees would be higher, and a percentage of the landed catch value would be collected for predator control.

Phase II Proposals

1) To retain an 'A' license, vessel production must be equivalent to $20,000 for 4 consecutive years ($5,000 yearly average).

2) After 1971, if average annual production for any 4-year period falls below $5,000, the vessels drops into category 'B'. It will be frozen in 'B'. (Even if production improves, it will not be allowed to return to 'A'.)

3) An 'A' vessel must be retired before a new one can be built.

4) Any new vessel introduced into the fishery must assume an 'A' production.

5) Any vessel not reporting landings for 2 consecutive years will not be licensed in any category.

Fishermen Informed in Advance

When Phase I was announced, the initial cut-off was based on production prior to Sept. 6, 1968. Under Phase II, fishermen would be informed in advance how much production would be required to maintain 'A' license.

New License Fees

Under Phase I, the minimum license fee was $20: $10 for commercial fishing vessel registration, $5 for salmon fishing validation, and $5 for personal fishing license.

Under Phase II, the minimum would be $25: $10 for vessel registration and $15 for salmon. Beginning in 1970, 1% of the landed catch value would be collected for use in controlling such predators as dogfish. This collection will increase by 1% of landed value in each of following 4 years, up to a maximum of 5%.

Further Fleet Reduction Expected

The Minister said he expected the new proposals to knock about 50% of the present 'A' vessels down to 'B' and leave about 2,000-2,500 in 'A'. This class produces well over 80% of total salmon landings. (Dept. of Fisheries & Forestry, Sept. 3; CFR, Feb. & Mar. 1969.)

* * *

NEWFOUNDLAND LANDINGS IN FIRST-HALF 1969

Total Newfoundland landings for first-half 1969 were 499 million pounds, substantially more than the 456 million landed in same period 1968. However, a comparison of data for the first 2 quarters 1969 reveals that increases in first quarter were significantly high than in second.

Lobsters and Cod Decrease

While landings of many fish increased, landings of cod, the major Newfoundland species, dropped markedly. The lobster harvest also decreased. Closing Placentia Bay for several weeks during the second quarter, because of pollution, probably caused these decreases. Greenland turbot landings also decreased despite the new sales campaign launched in the U.S. The capelin decrease probably was due to reduced demand.

Increased Species

Increased landings of 5 species that did not warrant mention in 1968--lumpfish, mackerel, trout, mussels, and scallops--prove Newfoundland fishermen are willing to fish for previously unexploited species. Crab landings increased sharply, probably because of the new crab-processing facilities at the Bonavista Cold Storage Company. (U.S. Consul, St. John's, July 30.)

* * *

CANADA (Contd.):

GOVERNMENT BUYS SALT COD FOR FOREIGN RELIEF

The government was slated to buy a million pounds of salted cod, worth about C$365,000, from east coast suppliers for Canada's food relief program in developing countries.

This purchase would clear remaining 1968 stocks, and even take part of this season's production. Suppliers were to deliver the fish to Montreal between the 8th and 14th of October.

Salt Cod Highly Valued

Relief organizations consider dried salted fish a prime food because of its high protein value. Canada has provided substantial quantities in the past 2 years and may provide more later this year. (Dept. of Fisheries & Forestry, Oct. 8.)

* * *

CONFERENCE ON AUTOMATION & MECHANIZATION SLATED

In a rapidly changing fishing industry, the introduction of ultrasophisticated catching and processing equipment, and the advanced operating and maintenance skill such equipment demands, raise many problems. These problems will be studied at a Conference on Automation and Mechanization in the Fishing Industry (CAMFI) in Montreal, Feb. 3-6, 1970.

Main Objectives

The structure of Canada's fishing industry is undergoing drastic changes in response to increasing competition from other fishing nations, and the problems of growing capital investment and productions costs. The main objective of the conference is to show how to meet these challenges and to improve pay and working conditions.

To Aid Industry Modernization

Participants who can contribute to modernization of the industry will represent government, industry, science, engineering, and business. More than 40 will present papers on the application of automation and mechazation and on related subjects, such as new management techniques. They also will discuss the automated and mechanized equipment, the present new processes and production techniques, or those that will become operational within the next 5 years.

The conference has been planned to benefit the fishing industry, fishing-vessel builders, and producers of the machinery, systems, and equipment required on vessels and in shore-based plants. (CAMFI, Aug. 7.)

* * *

OCTOBER WAS FISH PROMOTION MONTH

October was National Fish 'n' Seafood Month in Canada. Due to heavy summer fishing, fishery product inventories usually peak in October, making it an opportune time for a promotional campaign.

As its contribution, the Department of Fisheries and Forestry distributed recipe-photo releases to newspaper editors and food publicists. A 4-minute sound-track, color film, 'Take a Pack of Frozen Fillets,' was sent to the television stations; a new recipe booklet, with the same title, was released nationally. Special short scripts were provided for radio food commentators.

Home Economists Helped

The Department's home economists, who constantly test and develop fish recipes, supplied a number of newly tested, quantity recipes to restaurants and institutions. They appeared on radio and TV throughout the country to demonstrate fish preparation. They assisted in local fishing industry-sponsored activities. (Dept. of Fisheries and Forestry, Ottawa, Sept. 8.)

EUROPE

USSR

PROPOSES DAM TO PROTECT AZOV SEA

The Azov Fisheries Research Institute (AZNIRKH) has proposed damming the Kerch Strait to protect and conserve the rich fishery resources in the Azov Sea. The Strait, 25 miles long and 2-9 miles wide, connects the Azov and the Black Seas. It will take 5-6 years to complete the project at a cost of 150 million rubles (US$165 million).

Increasing Salinity Threatens Fish

The future of the Azov fisheries is in jeopardy, according to AZNIRKH scientists. They fear that about half the freshwater runoff from rivers flowing into the Azov will be diverted for agricultural and industrial use by 1980. A diversion of this magnitude would increase salinity up to 16-18 grams of salts in each kilogram of water, a concentration too great for sturgeon, pike-perch, Azov roach and bream to withstand. Their foraging grounds would be reduced to a small area in Taganrog Bay, at the mouth of the Don River, forcing them to migrate to the Black Sea. The projected dam, regulating the influx of Black Sea water, would control salinity and conserve these commercially valuable species.

Value of Fishery

In 1968, the commercial yield of pike-perch and bream, spawning naturally in the Don flood plains (50 days in spring), amounted to 30,000 metric tons; the commercial yield of all fish-culture enterprises around the Azov was only 3,000 tons. The scientists claim that the Azov's high productivity can be maintained only if the Don spawning grounds remain intact, and the Azov foraging grounds are preserved.

Dam Specifications

AZNIRKH has proposed a dike encompassing a 440-meter spillway dam with 22 metal-gated openings, ensuring a water flow of 10,000 cubic meters a second. A lock 260 meters long and 38 meters wide would be provided for ship passage.

Other Problems

The AZNIRKH scientists warn that damming the Kerch Strait will solve only part of the problem of decreasing freshwater runoff. An unanswered question is how to supply the slats and other chemicals needed for evolution of feed organisms and fish reproduction. ('Vodnyi Transport,' Sept. 2.)

* * *

DEEP-WATER TRAWLING TAKES ANTARCTIC COD

The USSR has begun commercial exploitation of "Notothenia", a species of cod found only in Antarctic waters. Unable to survive temperatures above 6° C. (42.8° F.), it lives at a depth of 300 meters (984 ft.). Its average length is 60-80 centimeters (23-31 in.). Notothenia flesh is delicate and tasty.

New Freezer-Trawler Used

The fishery is conducted by the Northern Fisheries Administration's Murmansk trawler fleet. A recent arrival, the processing trawler 'Skazochnik Andersen' has been averaging 10-20 metric tons per haul. ('Vodnyi Transport,' Aug. 21.)

The Danish-built 'Skazochnik Andersen' is a 'Skryplev'-class vessel of about 4,700 gross tons. This class combines processing freezers and stern trawlers.

* * *

VESSEL SEEKS SHRIMP OFF AFRICA

Anticipating a shrimp expedition scheduled to leave the Baltic port of Klajpeda on September 12, the medium trawler 'Skakhtersk' (Western Fisheries Administration) has been scouting commercial shrimp concentrations "off the coast of Africa" (presumably Mauritania, Senegal, and Guinea).

Using Echo Sounder

The vessel is equipped with an 'Omar' echo sounder, the first time Omar has been used to locate shrimp concentrations. Operating at high frequency, Omar can reveal fish concentrations down to 200 meters (650 ft.); operating at low frequency, to 400 meters (1,300 ft.). Working frequencies are 150 and 25.5 kilocycles a second. Shakhtersk also carries a new echo sounder, 'Zvuk-100M.' ('Vodnyi Transport,' (Aug. 23, 1969, and 'Sudostroenie,' No. 9, 1967.)

USSR (Contd.):

In the past, Soviet shrimp catches from West African waters have been exported to the U.S. via the Canary Islands.

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CARP AND PIKE BRED IN RESERVOIRS SUPPLIED WITH THERMAL WATER

A reservoir near Moscow is being supplied warm water by an electric power station. Fish raised in the reservoir have yielded 380 metric tons per hectare (2.47 acres), 600 times the yield of conventional fish-culture ponds. Their breeding areas were staked out with metal or synthetic fiber nets.

Allows High Growth Rate

The warm water prevents the reservoir from freezing over, even during the most severe winter. Roes of carp, pike, and other fresh-water fish can be started in special incubators in early spring. During the winter, 'insignificant' amounts of phytoplankton and other feed cause carp yearlings to grow 10%. ('Ekonomicheskaia Gazeta,' No. 34, Aug. 1969.)

No time period for measuring growth rate was given. Such growth would be remarkable in winter, when carp and other fresh-water fish either grow very little or not at all.

* * *

ARTIFICIAL CULTURE OF SEA CUCUMBERS & SCALLOPS BEGINS

Artificial culture of sea cucumbers in the Bay of Peter the Great, off Vladivostok, has been slated by the Soviet Pacific Research Institute for Fisheries and Oceanography. The Institute also plans to expand artificial culture of scallops in the same area. ('Vodnyi Transport,' Aug. 19.)

* * *

BATHYSCAPHE USED TO STUDY BEHAVIOR OF FISH IN TRAWL NETS

Soviet researchers studied the behavior of fish (horse mackerel and sardinella) in trawl nets in the Gulf of Mexico, January-April 1968. The 'Muksun' towed a bathyscaphe (Atlant-1) at 30-60 meters (98-197 feet) during daylight hours. No artificial light was used.

Fish were observed schooling ahead of the trawl opening. Some entered the net; some moved away in the direction of the trawl faster than trawl speed, 2.06-2.21 meters per second--at a rate of about 20 fish per cubic meter in area of trawl square. Fish inside the bag escaped the net at a rate of 40-50 per cubic meter. Entry into and exit from the trawl net were orderly while the trawl was open. Fish caught inside the trawl as it closed tried to escape through the meshes.

Factors Affecting Fish Behavior

Both visual and nonvisual stimuli appear to govern fish behavior near trawl nets. In turbid waters, or at night, the lateral line (a sensing organ) appears to control the fish's behavior, although luminescent organisms may reveal the nets.

Trawls with 150-millimeter and 100-millimeter wing meshes yielded almost identical catches. ('Rybnoe Khoziaistvo,' No. 7.)

* * *

FINDS JAPANESE ACOUSTICAL DEVICES UNSATISFACTORY

The Far-Eastern Fisheries Administration bought 21 acoustical gear-monitoring and fish-locating devices from Japan in 1968. Some of these had been made by Furuno. The devices, installed on the BMRTs 'Samarga,' 'Chernopiatko,' 'F. Krainov,' 'Tret'iskova,' 'Kazakhstan,' and 'Taishet,' were used in midwater trawling for Pacific hake.

E. German Devices Better

Soviet experts claim the Japanese devices compare unfavorably with similar East German devices. They suggest that the latter be used on new Soviet fishing vessels. ('Rybnoe Khoziaistvo,' No. 7, 1969.)

* * *

PURSE SEINING WITH ELECTRIC LIGHTS MAY BE DEVELOPED

A recent article in the official organ of the Fisheries Ministry indicates that the Soviets may be developing large-scale Pacific herring purse seining with electric lights.

USSR (Contd.):

Little is known about herring behavior under electric light, but experience seems to indicate that the species reacts positively. One Soviet purse seiner, on a fishing trip off Magadan (Okhotsk Sea), caught 10 metric tons in 1 haul using electric lights. ('Rybnoe Khoziaistvo,' No. 5, 1969.)

* * *

FISHERIES MINISTER PROMOTES 'MINCED FISH'

At a luncheon in Moscow, Fisheries Minister Ishkov and VNIRO Deputy Director Moiseev predicted a 100,000-150,000 metric ton annual minced-fish production in the 'immediate future.' Guests were served 26 different dishes prepared from minced fish.

Processed At Sea

Prepared from cod, hake, pollock, and snapper, the minced fish is wrapped in plastic bags and frozen at sea. It maintains a 'fresh fish' quality for 6-8 months. Since the average trip for a Soviet fishing vessel from port to fishing grounds is about 4,000 miles, most catches are processed at sea. Introduction of this new minced fish product could increase tremendously the output of edible fishery products. ('Vodnyi Transport,' Aug. 8.)

DENMARK

FIRST-HALF 1969 LANDINGS DROP BELOW 1968 RECORD PERIOD

Danish landings during the first 6 months of 1969 were running about 18% behind the record 1968 production.

Landings for fish meal and oil were down 24% due to poor weather early in the year. About 80% of the landings are used for meal. The fishery began in early January last year; this year's did not really begin until April. The season has not been as good and, even if the remainder of the year should be unusually good, the loss can not be made up. The drop in catch has caused a marked drop in production. Exports of fish meal amounted to 62,434 metric tons in first six months of 1969 (75,025 tons in first-half 1968).

Cod

Cod, the principal species used in export fish blocks, was about 9% below 1968. Danish exporters again have entered the U.S. market in great volume. Exports had dropped last year because of a U.S. price drop. Prices again are near former levels; about half the cod fillet production probably will be marketed in the U.S. Danish exporters are optimistic, U.S. consumption appears to be increasing, and there is some evidence of a decline in the Northwest Atlantic cod fisheries.

Landings of Principal Species--Jan.-June 1968-1969

	January-June		Calendar Year
	1969	1968	1968
	. . . . . . (Metric Tons)		
Plaice.	21,956	20,492	50,242
Cod.	59,087	64,914	107,390
Haddock	2,911	2,732	5,789
Herring for consumption	25,371	19,924	49,259
Salmon	747	849	2,089
Norwegian lobster . . .	377	504	1,737
Deepwater shrimp . . .	2,406	3,215	5,175
Other foodfish	22,752	23,532	61,058
Industrial fish	410,664	533,392	1,159,000
Total	546,271	669,554	1,441,739

Other Species

While cod fillets have been Denmark's principal export to the U.S., exporters are succeeding in marketing more plaice fillets. Denmark has large supplies of these and now is less able to market them effectively in England. Plaice landings increased by 7% this year. Landings of Norwegian lobster and shrimp, items in great demand in Europe, decreased during first-half 1969.

In all probability, the catch will continue to run below last year's, when weather permitted the greatest number of fishing days ever experienced. Should prices for cod fillets continue near present levels, or increase by a cent or two as some exporters anticipate, the added incentive would attract greater effort to the fishery. This would cause the catches to rise and more cod to be diverted from other uses. (U.S. Embassy, Copenhagen, Sept. 12.)

* * *

FAROESE CATCH DECLINES FURTHER

The 1968 Faroese catch declined more than 7,000 metric tons (4.41%) from previous years. The catches have declined steadily since 1962--to date, a total loss of 35,000 metric tons.

DENMARK (Contd.):

Both Greenlandic and Faroese waters yielded considerably poorer catches than before. The decrease was noted especially in the line-and-trawl fishery--although there was a 50% increase at one point in spring due to favorable weather and more vessels fishing.

Demersal Catch

Icelandic fishing areas no longer influence the demersal catch: only 5% of the demersal catch was taken off Iceland; the largest catches were made off Greenland. In 1968, demersal catch was 47.8% of the total; it had been 62% in 1967. The Newfoundland bank fishery has shown little growth since 1968, barely over 1,000 metric tons.

Herring Fishery

The herring fishery failed completely for gillnetters; power bloc trawlers were more successful. But total catch was still less than in 1967. The fishery failed entirely in home waters; catch declined 13,000 metric tons. No herring were caught off Iceland.

Trawler landings of fresh fish in Denmark more than doubled--15,392 metric tons compared to 6,318 in 1967. Foreign-vessel landings increased slightly.

Utilization & Production

As in previous years, only a small part of the catch was canned. Fish meal production rose slightly. Dried-cod production rose more than 1,000 metric tons. Spiced-herring production was the smallest in 16 years. Herring-oil production rose to more than 4,000 metric tons. ('Børsen', July 24.)

* * *

HIGH-SEAS SALMON FISHING INCREASES

About 30 Danish vessels caught around 350 metric tons of salmon off the coast of Norway from April to June (25 vessels and 140 tons for same period 1968). About 100 Norwegian vessels took part this year, catching about 400 tons (100 tons in 1968).

The Greenland Salmon Fishery

Last year, early reports had indicated that 20 vessels were going to fish salmon off Greenland; only about 9 actually went. Preliminary reports have indicated that more will try this year. Industry sources reported as many as 30 cutters being readied. Some are new and larger refrigerated vessels. The season is expected to continue into early December.

Encouraged by recent high-seas fishing successes, one vessel operator was planning to visit Japan in September. He hoped to learn more about methods of fishing tuna, swordfish, and porbeagle, with an eye to fishing off the Canary Islands. To enter this fishery, Danish fishermen would have to go only one-fourth the distance they cover going to Greenland. Should this materialize, it would take some pressure off the salmon. (U.S. Embassy, Copenhagen, Sept. 12.)

* * *

MINIMUM PRICES TO BE ESTABLISHED

In answer to a long-standing demand, Denmark passed a law in June 1969 establishing a system to fix minimum prices for first-hand sales of unprocessed fish landed in Danish ports. These minimums are to be established for cod, plaice, mackerel, and herring.

Industry & Government Unable to Agree

The Fisheries Minister, after negotiating with a committee of industry representatives, will determine minimum prices of fish for human consumption and fish for meal and oil. The committee, established August 11, has not been able to reach agreement. The system meets the wishes of most fishermen, who have run a system of their own for the last 2 years; but it fails to meet demands of many others, particularly from Esbjerg, for direct subsidies. The Minister, supported by 2 fishermen's unions, has resisted such demands.

Fishermen Dissatisfied

The fishermen are dissatisfied with the existing situation because expenditures for gear and equipment have been unusually heavy, catches have been down, and prices have been disappointing. (U.S. Embassy, Copenhagen, Sept.)

NORWAY

BRISLING CATCH IS SMALLER THAN EXPECTED

The good brisling season expected this year did not materialize. When fishing started on May 22 catches were reasonably good in the northern areas. In the southern areas that normally provide the bulk of the catch, the yield was disappointing. Things may have improved when areas where brisling had not yet met the required specifications were opened to fishing.

Pack and Stocks

Up until June, all the packers' raw material demands had been met--both the direct processing, and for deep-freezing in shore-based plants and on freezing vessels. By mid-June, brisling receipts had yielded about 160,000 cases. Total pack--brisling and sardines--was slightly in excess of same period 1968, but stocks were about 15% short.

	1967	1968	1969
	. . . . Cases (100 $\frac{1}{4}$ cans)		
Brisling	186,000	176,000	138,000
Sild	410,000	485,000	419,000
Kippers	122,000	108,000	111,000
Soft herring roes	42,000	30,000	17,000

Summer Herring

The fleet was prepared for the summer herring expected in waters near Bear's Island. A modest 15,000 barrels a few years ago, this year's target had been boosted to around 200,000 barrels in response to industry's demand for raw material to process into gafflebiter and similar products. Fishing was scheduled to start July 1, 10 days earlier than in 1968. (Norwegian 'Canners Export Journal,' July 1969.)

ICELAND

INCREASES SALMON HATCHERY

Salmon breeding is to be stepped up in Iceland's 10 fish hatcheries. During 1969, about 200,000 fry will be planted in the rivers and lakes. Obstacles have been cleared from some to make them more accessible for spawning. ('Atlantic and Iceland Review,' No. 2, 1969.)

FRANCE

FISHING FLEET DWINDLES

The French fishing industry is in trouble. Landings in 1968 were down 2% from 1967. Finfish fell 7%, and cod 11%. Wholesale turnover declined 0.2%.

Tonnage Decreases

During 1968, 98 fishing craft were laid up. This meant active vessel tonnage dropped 22,000 tons, about 10%. Under France's Fifth Plan, new vessels were to be added to the fleet at a rate of about 20,000 tons a year. But new vessels aggregated only 11,400 tons in 1967--and a mere 3,800 tons in 1968.

Exports Shrink, Deficit Rises

The negative balance of trade in fish and fish products has persisted. In 1968, imports increased 16% while exports decreased 11%. Only 13% of running costs were covered. The industry's deficit was about US$127 million, 5 times more than a decade ago. ('Fishing News,' London, June 13.)

* * *

SUBSIDIES GRANTED TO DRIED COD INDUSTRY

The government has granted a US$280,000 subsidy to FOMOR, the organization responsible for cod exports. FOMOR claims the subsidy is necessary because of cod stocks accumulated in the drying plants during 1968.

The accumulation, resulting from a drop in market prices, amounted to about 13,000 metric tons on December 15, 1968. It increased shortly afterwards, when 31 distant-water trawlers landed another 15,000 tons.

Subsidizes Export Drive

The subsidy is to help FOMOR make a real drive for increased exports at a time when neither trawler owners nor fish dryers can finance it. Already, they are unable to maintain the existing export level without government help because foreign competition is quoting lower prices on the world market. ('World Fishing,' London, July 1.)

UNITED KINGDOM

DOGFISH IS BECOMING POPULAR

Some fishermen and biologists are losing their dislike of the small sharks known in Britain as "rock hounds." It seems that dogfish can fetch fairly high market prices. Early this year, at Billingsgate, small skinned dogfish brought 21-26 U.S. cents a pound, while the larger ones sold at 26-29 cents.

Increasing Rates

British dogfish catches have increased steadily since 1960. Scottish 1966 landings were almost 5,000 long tons, compared to a mere 1,000 tons in 1954. Dogfish catches in England and Wales also have increased; their combined landings will top 6,000 tons. This means that U.K. fishermen catch over 24 million pounds a year.

May Need Conservation

Despite good demand for these "mini-sharks," fishery experts are concerned about declining stocks. It is believed that British catches have reached their peak, and the introduction of conservation measures has been suggested. This would be strongly challenged by many fishermen. If dogfish becomes more popular in many markets, its value will increase.

Popular in Europe

Fish-and-chip shops absorb large quantities. European fishmongers sell substantial quantities of dogfish steaks. Some Norwegian, German, and French connoisseurs consider it a table delicacy.

There are 4 species of dogfish in British waters; one is very rare. The spurdog, or piked dogfish, and the lesser spotted dogfish are the most common. These are the ones usually found in deep-sea trawling nets. ('Fish Trades Gazette,' May 31.)

* * *

WHITE FISH AUTHORITY RAISES INTEREST RATE

The White Fish Authority has announced rates of interest on loans made after August 23.

Loans for fishing vessels, new engines, nets and gear:

Less than 5 years--$10\frac{3}{8}\%$ ($\frac{1}{4}\%$ increase).

More than 5 but less than 10 years--$9\frac{5}{8}\%$ ($\frac{1}{8}\%$ increase).

More than 10 years but less than 15 years--$9\frac{3}{8}\%$ (no change).

More than 15 but less than 20 years--$9\frac{3}{4}\%$ ($\frac{1}{8}\%$ increase).

Loans for processing plants:

Less than 5 years--11% ($\frac{1}{8}\%$ increase).

More than 5 years but less than 20 years--$10\frac{3}{4}\%$ (no change).

The rates on loans made before August 23 are unchanged. ('Fish Trades Gazette,' Sept. 6.)

GREECE

FOREIGN TRADE TRENDS

In 1968, Greece imported 31,702 metric tons of fishery products worth US$12.9 million. In 1967, she had imported 28,962 tons worth US$11.5 million.

Fishery exports in 1968 dropped from 1967; however, 1968 export value was slightly greater because of higher prices for fresh and frozen fish. ('Alieia,' July 1969.)

LATIN AMERICA

MEXICO

FISHERIES DECLINED IN FIRST-HALF 1969

Mexico's fisheries declined 1.4% in first-half 1969 from first-half 1968. Oyster production increased markedly (47.4%), sardines 56.4%, and fish meal 58%, but shrimp was off 14.8% and anchovy 86.9%.

Fish Production, Jan.-June 1967-69			
Species	1969 1/	1968	1967
	..... (Metric Tons)		
Shrimp	12,478	14,643	16,164
Oysters	17,718	12,018	10,316
Sardines	22,063	14,107	14,709
Anchovy	1,488	11,325	10,000
Mackerel	4,531	4,259	3,692
Grouper	2,854	2,136	1,812
Abalone	1,154	1,463	1,003
Lobster, spiny	590	485	766
Other	34,830	42,427	33,395
Industrial Products:			
Kelp	15,337	14,381	10,001
Fish Meal	8,517	5,390	5,035
Other	2,102	2,814	2,533
Total	123,662	125,448	109,426

1/Preliminary figures.

Shrimp exports (principally to the U.S.) were valued at 227 million pesos (US$18.16 million), down 12.4% from 1968. Shrimp dropped to 9th place in export value--after cotton, sugar, corn, coffee, tomatoes, petroleum products, fruits, and sulphur. Only continued high prices kept shrimp from falling even lower.

Record May Improve

Since the Gulf Coast's best production months were still ahead, this downward trend in production and exports may still reverse. (Regional Fisheries Attaché, U.S. Embassy, Mexico, Sept. 13.)

* * *

DECLINE EXPECTED IN WEST COAST SHRIMP FISHERY

The 1969/70 west coast shrimp season opened September 15. Both industry and government are pessimistic, expecting a continuation of last season's diminished catch. Measured by exports, the 1968/69 catch dropped 35%; it is not expected to recoup this season.

Reasons for Decline

Various reasons are given for the decline: unfavorable climatic and oceanographic conditions, aging vessels, and poor management. A further decline will be hard on an industry that needs new vessels and must finance them with earnings from shrimp sales.

Industry representatives now seeking foreign capital for new shrimp trawlers may be successful. (U.S. Embassy, Mexico, Aug. 15.)

* * *

SHRIMP RESEARCH CONDUCTED ON WEST COAST

The Directorate General of Fisheries, in cooperation with the fishing industry, has begun intensive shrimp resource studies on Mexico's west coast. Eight shrimp vessels have been provided by shrimp cooperatives, and 2 by private owners. A systematic plan of studies, designed by the Mexican National Institute for Research in Fisheries Biology, began on July 17.

The Operation

An area from Rio Colorado to Teacapan, south of Mazatlan, has been divided by a line at Rio Mayo. Two boats in the northern half and 2 in the southern are fishing about parallel to the coast, sampling the stocks at 4 depths. Two other boats are working intensively in each of 3 specially selected limited areas. The vessels use normal fishing gear and each carries a biologist and a fishery technician.

Special Work Done

The coastal research will be supplemented by special work, including shrimp marking, in the areas' estuaries and lagoons. Oceanographic observations from two fishery inspection vessels should further supplement the work. The total effort is expected to add considerably to the knowledge of the distribution, identity, composition, and dynamics of the shrimp stocks--and of certain valuable finfish stocks.

MEXICO (Contd.):

Research Goals

The cooperatives and boat owners are meeting all vessel operating costs and part of the research costs. The research may help government and industry to understand better the west coast shrimp and fish resources, and lead to increased and more-stable production (U.S. Embassy, Mexico, Sept. 3.)

* * *

SHRIMP VESSELS TO GET NEW REFRIGERATION PLANTS IN U.K.

Over 100 Mexican shrimp vessels are to get new refrigeration plants. The plants, to be installed in Great Britain, will cost US$4.8 million.

The new plants will ease distant-water operations, better shrimp quality, and improve catch preservation during long trips. The catch will be cooled in 2 seawater tanks, and then stored in cold-storage rooms at 0° C. (32° F.) ('Børsen,' June 18.)

* * *

FISH MEAL PLANT AND SARDINE CANNERY ARE BUILT IN GUAYMAS

Construction of a fish meal plant and a sardine cannery has begun in Guaymas, Sonora.

The fish meal plant, Industrializadora de Productos Marinos, S.A., will be Mexico's largest. It will have an hourly capacity of 18 metric tons of raw fish, or a potential daily output of 70-80 tons of fish meal. Equipped with rebuilt U.S. machinery and designed with U.S. advice, the new plant should be completed by the end of the year. Intended to exploit the Gulf of California sardine and anchovy resources, it should substantially reduce Mexican fish meal imports (51,683 tons in 1967).

The Cannery

The cannery, Empacadora del Pacifico, S.A., will have a daily capacity of 30 to 40 tons of raw fish. Although primarily for sardines--tuna and shrimp may be included when appropriate. Substantial amounts of sardines have been caught around Guaymas. They have been headed and gutted locally, and shipped, fresh in ice, to be canned in Ensenada. The new cannery should eliminate most, if not all, of this long, expensive routing.

Private Operators

The two plants, financed entirely by private Mexican capital, not by Banco Nacional de Fomento Cooperativa (BANFOCO). BANFOCO acquired most of the fish-processing plants on Mexico's West Coast in 1967.

The plants will employ more than 300 persons. Refrigeration and storage facilities will be expanded to accommodate the new plants.

Shrimp Port Diversified

Guaymas fishing circles hope that the diversification in this nearly exclusive shrimp port will help to offset bad shrimp seasons like the one in 1968/69. (U.S. Embassy, Mexico, Sept. 13.)

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VERACRUZ FISHERIES

In first-half 1969, Veracruz landings rose 6% in quantity and 22% in value over same period 1968.

The new director of the Centro Nacional de Ciencias y Technologias Marinas (Veracruz Marine Science and Technology Center), a Japanese-Mexican marine biologist, Dr. Luis Kazuga, has announced an ambitious program to improve the fishing industry. Mexican fishing interests in Veracruz are conducting considerable fishery experimentation and instituting technical improvements in hopes of increasing operational efficiency and production. Japan is furnishing much technical assistance, and Spain is cooperating.

Net Installations Studied

For several months, Japanese specialists have been offering instruction in modern fishing techniques to local fishermen and to those from the Puerto Piloto Pesquero (PPP) in Alvarado. One of their projects is a feasibility study of permanent net installations along the coast. Before placing the nets, the Japanese will assist local fishermen in studies of the area's currents and marine life.

MEXICO (Contd.):

The first experiment, with a Japanese-built stationary net, produced promising results in late March. Placed about 2 or 3 kilometers off the coast of Mocambo during the spring mackerel run, it produced a catch worth US$40,000. A larger net, valued at $60,000, installed at the same location on July 1, caught 2 tons of fish worth $480 on the first day. Plans to instal other nets have been postponed until the Japanese can study the technique's effectiveness.

'Bacalao' Cod Fishery

Between November 1968 and April 1969, Mexican and Spanish fishermen caught 80 tons of cod in the northwest Atlantic. Under a Spanish-Mexican agreement, the Mexicans are to take over operation of the Spanish-built boats as soon as the Mexicans have acquired sufficient capability.

The cod were landed in Coatzacoalcos and shipped to Alvarado for initial processing. The fish were then taken in refrigerated trucks to Mexico City to be made into bacalao (salt-cod) by Empresa Bacaladera Mexicana S.A. de C.V. The company has established operations in Coatzacoalcos partly because of high labor costs in Veracruz, and partly because the port of Veracruz lacks the facilities to load fish directly from vessels into refrigerated trucks. Coatzacoalcos is 325 kilometers south of Veracruz, and 750 kilometers from Mexico City.

Cooperatives Planned

The Governor of Veracruz plans to establish 5 fishing cooperatives in various parts of the state to improve the marginal operations of individual fishermen. Thirty-five fishermen in the Boca del Rio area already have formed the first cooperative. The Banco de Fomento Cooperativa (BANFOCO) will provide funds to build a 70-ton refrigerated warehouse and to buy equipment. The Cooperatives will receive technical assistance from, and sell their catches through, the PPP in Alvarado.

Vessel Construction

Astilleros de Veracruz, S.A. (AVSA) has several new contracts to build shrimp boats. Venezuela has ordered 10 small boats at a total cost of US$124,000. Iran has contracted for 15 boats at US$108,000 each. AVSA laid the keel of the last of 15 shrimp boats previously ordered by PPP on June 17, and delivered the third completed one on the same day. AVSA hopes to deliver all 15 by the end of the year, but it is doubtful that more than 8 will have been completed by then.

BANFOCO is drawing up a new US$2.4 million contract for AVSA and a shipbuilding firm in Tampico to build 50 shrimp boats for PPP. If the contract goes through, PPP will have a fishing fleet in several years capable of fully using its facilities. (Reg. Fish. Attaché, U.S. Embassy, Mexico City, Aug. 16.)

PERU

FISH MEAL OUTPUT &
EXPORTS, JAN.-JULY 1967-69

Fish meal production was low in July because fishing was restricted to the southern port of Ilo. Exports were high; most went to the U.S. and western Europe.

The 1968/69 anchovy season closed May 31, 1969. The 1969/70 season opened September 1. Sources reported average catches of 35,000 metric tons a day. If the catch continued at this rate, September fish meal production would be about ⅓ below the September 1969 production of more than 257,000 tons.

Fish Meal Production & Exports, Jan.-July 1967-1969

	1969	1968	1967
	..... (Metric Tons)		
Production	1,011,111	1,048,873	1,029,766
Exports	1,234,130	1,255,190	883,398
Stocks on hand July 31 . . .	139,714	361,977	504,818

New Rules

The Instituto del Mar had not established a quota for the new season by Aug. 21, although a quota of 8.5 million tons and a closed season or "veda" in Jan.-Feb. had been recommended. No fishing will be permitted on Saturdays and Sundays. Also, fishing will be suspended at any port where half, or more than half, of the fish caught is less than 12 cm. long. (Sociedad Nacional de Pesqueria, Circ. 2180, Aug. 21.)

ECUADOR

TUNA PRODUCTION & EXPORTS DECLINED IN 1968

Tuna, Ecuador's most important fishery, seems to experience alternating good and bad years. In 1968, the tuna catch declined 10% from the 1967 record of 20,100 metric tons. This accounted for about 60% of overall reduction in exports of fish and fish products in 1968. About 90% was bonito, Euthuymus pelamais, nearly all caught within 20 miles of shore.

Tuna Production & Exports, 1966-68			
	1968	1967	1966
	.... (Metric Tons)		
Landings (live wt.)......	18,202	20,127	11,968
Exports, frozen tuna	6,884	9,941	5,019
Exports, canned tuna, bonitos, skipjack, etc. ..	1,600	2,500	1,700

65 Pole Boats

The fleet remained relatively static--about 65 pole boats (none over 20 tons) and 6 small purse seiners. Two of the purse seiners are the only tuna vessels equipped with brine tanks.

Frozen Tuna To U.S.

Eighty percent of tuna export is shipped frozen, the remainder in 24-lb. institutional canned packs (mostly 1- or 4-pound cans). All frozen tuna is shipped to the U.S., primarily to Puerto Rico. About 90% of canned tuna, packed in brine, is shipped to U.S., the remainder goes to other countries. Some shipments made to Brazil are packed in soybean oil in $\frac{1}{2}$-lb. cans; the cans and oil are imported from U.S. Ecuador levies tax of 4 centavos (about $\frac{1}{5}$¢ U.S.) a pound on frozen tuna exports. (U.S. Consulate, Guayaquil, Sept. 2.)

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1968 SHRIMP CATCH & EXPORTS SET RECORDS

The 1968 shrimp catch was 6,101 metric tons, a record for Ecuador. About 70-80% was medium and large white--primarily Penaeus occidentalis, with some P. stylirotris and P. vannamei. These were headed at sea. The remainder was small titi, Xiphoneneus, pomada, Protrachypene precipua, and some tigre, Trachypeneus byrdi, T. favea, T. similus pacificus. These were landed heads-on, unpeeled.

Most Caught in Guayaquil Gulf

Most shrimp are caught in Gulf of Guayaquil; the rest within 10 miles off Playas and Manat. The season lasts 12 months. The deep-water red shrimp, P. brevirostris, still eludes local fishermen. In time, the large vessels probably will find and exploit the beds.

Shrimp Fleet

Industry sources estimate the fleet has expanded from 174 boats to 195. Catch per boat has dropped despite record catch.

About 75 boats are 65 feet long or longer, mostly wooden hulls, and cost about $35,000 to build. Only two have steel hulls. Each is 75 feet long and was built in Ecuador for about $125,000.

Brine Refrigerated Tanks

About 70% of the fleet, including almost all larger vessels, have refrigerated brine tanks. Average trip time for larger vessels is about 2 weeks; the smaller boats, operating off Manta and Playas, return to port daily.

Shrimp Production & Exports, 1966-68			
	Catch Live Wt.	Exports	
		Value	Quantity
	Metric Tons	US $1,000	Metric Tons
1968	6,600	2,144.7	2,900
1967	6,000	2,229.0	2,700
1966	5,300	1,953.7	2,400

Exports

Nearly all the processed shrimp is exported to the U.S. It is shipped in 5-pound cartons, ready for market. The Ecuadorean government levies an export tax of 19 centavos (about 1U.S.¢) per pound. (U.S. Consulate, Guayaquil, Sept. 2.)

KOREA RAISES ISSUE OF JAPAN'S IMPORT RESTRICTIONS

S. Korea requested a broad reappraisal of Japanese tariff policies and import restrictions at the Japan-S. Korea Trade Conference in Tokyo, August 19-21.

Hoping to halt a growing imbalance of trade, Korea asked Japan to lower import duties on more items, reduce tariffs on 27, and eliminate certain other import restrictions. She also asked for more favorable regulations on laver imports and marketing, and reduction or elimination of tariffs on nonedible seaweed, squid, and salted sea urchin. Japan conceded only the 5% duty on certain types of nonedible seaweed.

Objects to Laver Import Restrictions

S. Korea objects particularly to the import procedures for dried laver. (In 1968, dried laver accounted for 51.6% of the value of all her marine-product exports to Japan.)

Japan permits Korean laver imports only between April and September. Furthermore, the sale price is not established until shipments have been completed and quality determined. Korea called this discriminatory and inconsistent with cordial commercial relations. Japan replied that her domestic producers must operate under the same system (30% of Japan's coastal fishermen harvest laver) and refused to change the procedures.

Value of Korean Marine Products Exports to Japan in 1967 and 1968

Item	1968	1967
	. . . . (US$1,000)	
Fresh or Frozen:		
Tuna and skipjack	1,145	1,142
Spanish mackerel	2,489	2,623
Shrimp	2,867	2,769
Other	4,147	4,056
Dried, Salted or Smoked:		
Sea urchin roe	880	1,357
Squid	1	1,317
Other	420	380
Fish Preparations	804	2,510
'Kanten'	761	3,553
Dried Laver	16,536	10,901
Other	2,032	1,808
Total	32,082	32,416

Laver Production Down

On May 28, Korea's Office of Fisheries arranged to export 4.8 million bundles of laver during April-September, although production had amounted to only 7.68 million bundles--less than half the 1968 total. Japan could buy only 3.63 million and, when prices were established on July 10, actually had imported only 2.53 million.

Shipment of the remaining 2.27 million bundles had been scheduled for early August but, because of poor production, only 1 to 2 million reportedly would be available.

Higher Prices Established in 1969

The new price average is 2,079 yen (US$5.78) a bundle, almost 700 yen above 1968. A bundle of high-grade laver is 2,310 yen (US$6.39), and low grade, 2,050 yen (US$5.69). About 90% is low grade.

The buying price for Japanese importers is 1,800 yen. They may add 250 yen a bundle--150 for import duty, 54 for commission, 4 for warehouse charges, 24 for interest--and deliver to the Laver Association at 2,050. The Association adds 7 yen a bundle before distribution to wholesalers.

Ministerial Discussion

The Koreans again brought up the subject of dried laver at the 3rd Japan-Korea Ministerial Conference in Tokyo, August 26-28. Korean demands were essentially the same as before--revision of import and marketing procedures. Japan's position remained unchanged, but she promised to reduce tariffs on some secondary marine products, and agreed to continue joint fisheries projects and to extend credit for fishery development.

JAPAN

PURSE SEINERS REPORT GOOD FISHING OFF WEST AFRICA

Nichiro's Fishing Company's purse-seine fleet off west Africa made good yellowfin and skipjack catches in July. The average was 13 tons a day per pair of seiners. The fleet included 5 pairs of seiners (two less than in 1968), and 2 refrigerated carriers, 'Haruna' (1,427 gross tons) and 'Chichibu Maru No. 2' (1,697 gross tons).

Insufficient Freezing Capacity

A problem was that the carriers have a combined freezing capacity of 100 tons a day and could not process all the catch. When fishing is good, the catch at times exceeds 100 tons.

This problem may worsen when a new 350-ton combination pole-and-line seiner joins the fleet in December. The vessel, now under construction in Japan, will cost about US$778,800. It will be equipped with a Norwegian power block. ('Shin Suisan Shimbun Sokuho,' July 18.)

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NORTH PACIFIC WHALING IS SUCCESSFUL

The 1969 Japanese North Pacific whaling expedition ended August 4. The 3 mothership whaling fleets attained their assigned catch of 886.5 blue-whale units. Their combined output totaled 54,983 metric tons of processed products, about 1,200 tons more than planned. ('Nihon Suisan Shimbun,' Aug. 13.)

Production	'Nisshin Maru'	'Kyokuyo Maru No. 3'	'Tonan Maru'	Total
	. . . . (No. of Whales)			
Whales:				
Fin	186	192	198	576
Sei	1,155	1,317	1,119	3,591.
Blue-whale-units	285.5	315.5	285.5	886.5
	. . . . (Metric Tons)			
Products:				
Fin whale oil . .	4,015	4,378	4,190	12,583
Frozen products .	12,094	14,261	12,927	39,282
Salted products .	258.4	110	236.2	604.6
Meal	142	273	-	415
Solubles and others	1,988.6	-	20	2,008.6
Total	18,498.0	19,022.0	17,373.2	54,893.2

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EASTERN PACIFIC SAURY FISHING IS DISAPPOINTING

The Taiyo, Nihon Suisan, and Nichiro fishing firms sent 6 vessels to the northeastern Pacific on an exploratory saury fishing cruise in July. The vessels are equipped to fish with stick-held dip nets or scoop nets. In early August, they reported the catch disappointing.

Off N. America

From July 22-31, Taiyo's 'Azuma Maru No. 6' (238 gross tons) worked off the North American coast from Vancouver to San Francisco. She found very light concentrations of saury and noted that their response to searchlights was poor.

Azuma Maru's primary objective was to study the abundance and distribution of saury as tuna bait. Licensed to fish until August 10, she cut her survey short because of stormy weather all along the Pacific coast. After a refueling stop at Terminal Island, Calif., she proceeded to eastern Pacific tuna and marlin grounds.

Trawlers South of Aleutians

Nihon Suisan's trawlers 'Shinano Maru' (539 gross tons) and 'Koshu Maru No. 8' (85 gross tons) fished near 40°-45° N. latitudes and 165°-175° E. longitudes, south of Aleutians, until late July. They found no sizable school. Attracting lights proved ineffective. The 2 trawlers, working together, had taken only about 7 tons of saury by the end of July. Later, they moved eastward to continue their search.

Trawlers Move Eastward

Two Nichiro trawlers, 'Akebono Maru No. 17' (499 gross tons) and 'Akebono Maru No. 21' (492 gross tons), proceeded eastward between parallels 41°-45° N. latitudes in early August. At that time, they had not encountered any significant concentrations.

Nichiro's third trawler, 'Akebono Maru No. 18,' 499 gross tons, was shrimp fishing in northern waters and had not begun saury fishing. ('Suisan Tsushin,' Aug. 5.)

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JAPAN (Contd.):

BAIT SAURY SAMPLE SHIPPED FROM U.S.

The Federation of Japan Tuna Fishery Cooperative Associations (NIKKATSUREN) recently received a 6-pound sample shipment of saury taken by a U.S. vessel about 80 miles off San Francisco. The vessel had been exploring the commercial possibilities of the saury resource off California. The sample was similar to the saury taken off Japan--medium-size fish used as tuna bait.

Possible Export to Japan

In view of the poor fishery off Japan in recent years, and the consequent high prices, the U.S. is considering supplying the Japanese. However, NIKKATSUREN officials said that prospects of procuring bait saury from the U.S. do not look bright. Both the price and the quantity available are uncertain, and Japan still restricts imports. ('Suisan Keizai Shimbun,' Sept. 11.)

* * *

RESEARCH VESSEL FINDS PROMISING GROUNDS IN S. ATLANTIC

The tuna longliner 'Azuma Maru No. 37' (314 gross tons), searching for new tuna grounds in the South Atlantic since May 26, has found some promising albacore and big-eyed grounds. Near 33°-$36^{\circ}03'$ S. latitude and 50° W. longitude, she took 41 big-eyed (1,938 lbs.) and 216 albacore (9,504 lbs.). The government is paying half the exploratory-cruise expenses.

The vessel was scheduled to call at Buenos Aires, Argentina, August 4 to transship about 120 metric tons--80 tons of albacore and 40 tons of big-eyed.

To Fish Higher Latitudes

On the next leg, Azuma Maru was slated to seek southern bluefin in the higher latitudes near 45°-50° S. She is scheduled to return to Japan in March 1970. ('Suisancho Nippo,' July 22.)

* * *

ARTIFICIAL CULTIVATION OF TUNA WILL BE TRIED

The Japanese Fisheries Agency plans to try for commercial-use artificial cultivation of tuna. About 60 million yen (US$167,000) will be appropriated in fiscal year 1970 (April 1970-March 1971) for an experiment. It will be conducted by the Far Seas Fisheries Research Laboratory, Mie Prefectural Fisheries Research Station, and Tokai and Kinki Universities. Land owned by Tokai University, southwest of Tokyo, will be leased for use as the culture area.

The Experiment

Tuna will be reared from larval stage to maturity for about one year. Big-eyed is the primary species being considered. Bluefin requires 8 years to reach maturity, but big-eyed can be grown in one year to 50-60 centimeters, larger than cultured yellowtail. At that size, it can be used for "sashimi" (sliced fish served raw).

Potential Problems

While a tuna-seeding technique has been tried successfully in Japan, the Agency has cited potential problems in commercial cultivation. Tuna are deep-sea fish and may die if reared in a confined area--a tank, for example, where they might swim into the walls. While millions of eggs are released during spawning, the rate of survival for juvenile and adult stages is unknown. Temperature conforming to natural environment during spawning and rearing periods also may be difficult to control. Although tuna can be fed water fleas and brown shrimp, they are voracious eaters. This poses a question of their value as a commodity--the cost of feeding relative to growth. ('Shin Suisan Shimbun,' July 21.)

* * *

OWNERS HOPE TO IMPROVE TUNA PURSE SEINING IN EASTERN PACIFIC

Owners of 4 purse seiners that failed dismally in the eastern Pacific tuna fishery this year are seeking improved performances in 1970. The season opens January 1. Large vessels and speed boats may be used. The independently managed seiners may unify operations.

JAPAN (Contd.):

Late Arrivals in Eastern Pacific

The seiners landed only about 360 tons of yellowfin during the 1969 season. This disappointing performance has been attributed to their late entry. By the time they arrived, the yellowfin had left the coastal area and were associated with schools of fast-swimming porpoise. These schools travel too fast for the slow seiners. ('Katsuo-maguro,' Sept. 9.)

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MORE FISHING VESSELS ARE EXPORTED

From 1965 through 1968, Japan exported 405 fishing vessels--219 draggers, 159 tuna vessels, and 27 purse seiners. She exported considerably more to S. Korea than to other countries.

Over three quarters went to 4 countries--185 to S. Korea, 66 to the Philippines, 38 to Taiwan, and 29 to the Ryukyus.

S. Korean Orders Rise

Applications for export of draggers to S. Korea have increased again this year because the latter wants to develop a pelagic fishery to earn foreign exchange.

Korean import restrictions are more strict this year; the import of fishing vessels more than 4-5 years old has been banned. No such restriction has been imposed by any other country, and exports to other countries will continue as before. ('Minato Shimbun,' July 6.)

* * *

SUPER TRAWLERS PLANNED

Four fishery firms--Nihon Suisan, Hokoku Suisan, Taiyo, and Tokushima Suisan--are planning to build 5,000-gross-ton trawlers to operate in northern waters in 1970. Two other major firms, Kyokuyo Hogei and Hoko Suisan, also are considering 5,000-ton trawlers.

Nihon Suisan has ordered a 40-ton daily capacity minced-meat plant and a 125-ton meal plant for its trawler. The other firms are planning similar installations.

Fish-Meal Production Boosted

Together with 'Taiyo Maru' (2,886 gross tons) and 'Akebono Maru No. 72' (3,500 gross tons), now being fitted with meal plants, such vessels would boost substantially Japan's 1970 factoryship production of minced meat, meal, and frozen products. ('Suisancho Nippo,' Aug. 5.)

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NEW TUNA LONGLINER PERFORMS WELL

On July 13, the tuna longliner 'Yakushi Maru No. 38' (254 gross tons), a bulbous-bow, all-weather vessel built in early 1969, returned from a 141-day trip to the eastern Pacific. She brought back 176 metric tons of tuna (mostly big-eyed) taken near 4°-12° S. latitudes and 120° W. longitude, southwest of Clipperton Island.

Catch Brought High Prices

The catch, frozen aboard by a trolley-type, fish-hanging, and semi-air-blast-freezing system, retained a high degree of freshness and good meat quality. It brought high ex-vessel prices--averaging over 300 yen a kilogram (US$756 a short ton) at Shimizu.

Stable Craft

The vessel's stability was good and double-deck construction provided a safe working area. On July 24, she departed again for the eastern Pacific. The owners hope for annual earnings of over $611,000. ('Suisan Keizai Shimbun,' July 29.)

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TWO MODERN TUNA LONGLINERS ORDERED

The Hoko Suisan Fishing Company recently ordered two 405-gross-ton, all-weather, tuna longliners for high-latitude operations from Usuki Shipyard. The advanced-design vessels will be equipped with modern installations, including a reel-type longline retriever and a freezing unit capable of very low temperatures. They should be completed by March 1970.

Specifications

The vessels' main specifications are: length 166 feet; breadth 29 feet; depth 13

JAPAN (Contd.):

feet; 1,600 hp. engines; 11.5 knots cruising speed; 6-ton daily freezing capacity with trolley-type fish hangers, and 1.5 tons in freezing trays; and 270 metric tons carrying capacity. They will carry 22-man crews. ('Minato Shimbun,' Sept. 7.)

* * *

FISHERIES AGENCY BUILDS 1,500-TON PURSE-SEINE RESEARCH VESSEL

The Fisheries Agency has decided to build a 1,500-gross-ton, purse-seine research vessel patterned after the large U.S. commercial seiner. The vessel will carry two 40-knot speedboats and search for skipjack and other surface tuna schools. This is intended to help the tuna fishery, which is in financial trouble because of declining longline catches. She also could be used to investigate other resources, such as saury, mackerel, and sardines.

The Vessel

The vessel will be 223 feet long, 46 feet broad, and 23 feet deep. Two 5,500-hp. main engines, coupled to controllable pitch propellers, will give a maximum speed of 18 knots. Other equipment will include a side thruster, a stabilizer, and a Norwegian power block. Construction is to be completed in 1971. ('Suisancho Nippo,' July 25 & 28.)

* * *

FROZEN TUNA COMMISSION SALES GROW

During Jan.-April 1969, member companies of the Frozen Food Exporters Assoc. exported 18,955 metric tons of frozen tuna caught by other countries. Japanese exports of frozen tuna for the same period were 20,610 tons.

The 18,955 tons handled through commission sales were taken mainly by Taiwanese and S. Korean fishing vessels; 12,672 tons were exported to the U.S., and 6,283 to Italy.

Yellowfin Is 60%

Yellowfin accounted for 11,312 tons--60% of total sales. Japanese yellowfin exports during the same period were 8,425 metric tons--20% below commission sales. Albacore accounted for 7,000 tons of total sales (Japanese exports were 8,795 tons); big-eyed 616 tons, and skipjack 584 tons.

Exports Unchanged

Japanese frozen tuna exports for same period 1968 were 39,138 tons. During first 4 months of 1969, Japanese exports were half the 1968 period's. However, when commission sales are added, the quantity exported remains the same. ('Suisan Tsushin,' July 5.)

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FROZEN TUNA EXPORTS DIP IN FIRST-HALF 1969

Frozen tuna exports during January-June 1969 of 32,980 metric tons were down 37% from the 52,190 tons exported in same period 1968. Yellowfin exports declined 47% from same period 1968; albacore decreased 19%.

Main Importers

Principal importers were: U.S., 12,274 metric tons (19,239 in 1968); Puerto Rico, 7,654 (11,570); Italy, 5,965 (12,558); Malaysia, 1,866 (939); and American Samoa, 1,575 (3,366).

The 1969 exports are expected to total about 65,000-70,000 tons at the most, compared with 105,000 tons in 1968. ('Suisan Tsushin,' July 22.)

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PREMIUM ON EXPORT CANNED TUNA INCREASED

On July 15, the Tokyo Canned Tuna Sales Co. announced an 11-14 U.S. cents-per-case premium increase on canned whitemeat tuna in brine for export to the U.S. The increase resulted from the depletion of the company's canned tuna stocks. It is not known whether all of the present stock will be sold under the new price.

Sold Half Stock

During the July 8-11 sales, the company offered about 200,000 cases and received buy-offers totaling 400,000 cases. It decided to sell half the stock initially, and to allocate the remainder according to the buyers' past

JAPAN (Contd.):

performance and quantity ordered during recent sales.

Further upward price adjustments may be made if buy-offers increase. The recent premium increase was strongly opposed by the trading firms. They claim the present monopolistic sales system must be eliminated to end such arbitrary practices. ('Suisan Tsushin,' July 17.)

New prices are:

Style and Can Size		Present Price 1/	Premium		
			Original	Additional	Total
		(US$/Case)			
Canned whitemeat tuna in brine:					
Solid:	7-oz. 48's	11.11	0.28	0.14	0.42
	13-oz. 24's	10.33	0.28	0.14	0.42
	$3\frac{1}{2}$-oz. 48's	6.66	0.17	0.11	0.28
	$66\frac{1}{2}$-oz. 6's	12.33	0.42	0.14	0.56
	6.6-lb. 6's	21.17	0.83	0.14	0.97
Flake:	$6\frac{1}{2}$-oz. 48's	8.11	0.20	0.11	0.31
Chunk:	6.6-lb. 6's	18.94	0.56	0.14	0.70

1/Exwarehouse, Shimizu, Japan.

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CANNED TUNA IN OIL EXPORTS DECLINE

Canned tuna in oil exports, January-June 1969, were 4,680,764 pounds valued at US$2,016,500; these were sharply below comparable 1968 exports of 15,910,088 pounds worth $4,976,900.

The decline was due to short supplies of skipjack (the principal species used for canned tuna in oil) and higher export prices. ('Katsuo-maguro Tsushin,' Aug. 11.)

* * *

FROZEN SHRIMP IMPORTS CONTINUED HIGH IN JUNE

Japan imported 4,122 metric tons of frozen shrimp worth US$11 million in June, surpassing the 4,000-ton mark for the 3rd straight month. Imports in June 1968 were 2,324 tons.

The imports were reported to have increased frozen-shrimp holdings to around $1\frac{1}{2}$ months' supply, depressing prices for smaller-sized shrimp on domestic market.

The principal suppliers during June were: Australia, 526 metric tons; Hong Kong, 440; Thailand, 404; Mexico, 397; and Communist China, 366. ('Suisancho Nippo,' July 17.)

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IMPORT RESTRICTIONS LIFTED ON SMOKED SCALLOPS & SQUID

The government has decided to reduce the number of commodities on the residual import restriction list from 120 to 60. Smoked scallops and smoked squid, now under import quotas, definitely will be decontrolled.

Fresh and frozen yellowtail, jack mackerel, Pacific mackerel, saury, sardine, cod, herring, squid, and scallops, salted cod and herring roes, dried laver, and marine-animal meal and scraps will remain on the list. ('Suisan Tsushin,' Sept. 22.)

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YAIZU LANDINGS ROSE IN AUGUST

Landings at Yaizu in August of 7,792 metric tons (worth about US$4.6 million) were 118 tons over the 7,674 ($4.4 million) landed in August 1968. Bluefin and albacore landings were down but good skipjack fishing off Japan in August resulted in sharply increased landings compared with the same month last year. ('Kanzume Tokuho,' Sept. 4, 1969.)

Landing and Average Exvessel Prices, July-August 1969 & July 1968

	Quantity			Average Price		
	1969		1968	1969		1968
	Aug.	July	Aug.	Aug.	July	Aug.
	(Metric Tons)			(US$/Short Ton)		
Tuna:						
Bluefin 1/	2,708	3,267	4,004	975	849	736
Albacore	187	780	306	489	434	436
Skipjack	4,266	8,291	2,848	287	262	250
Mackerel	89	38	25	144	131	192
Others	542	448	491			
Total	7,792	12,824	7,674			

1/Includes yellowfin and big-eyed tuna.

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JAPAN (Contd.):

SHRIMP TEAMS VISIT SOUTHEAST ASIA & LATIN AMERICA

The Japan Fish Products Import Assoc. plans to send a shrimp team on a government-subsidized trip to Pakistan, India, and Thailand. The team will survey local shrimp fishing, processing, and marketing; it will advise on quality control and sanitation. This will facilitate Japanese imports of frozen shrimp from the 3 countries.

In 1967 and 1968, the association sent similar missions to southeast Asia and the mid-East. As a result, shrimp purchases from those areas have increased sharply.

Other Visits Planned

The association also plans to send a shrimp mission on a 45-day trip to 12 Latin American countries--Brazil, Surinam, Guyana, Trinidad, Tobago, Barbados, Venezuela, Colombia, Panama, Costa Rica, El Salvador, and Mexico. ('Suisan Keizai Shimbun,' July 17.)

* * *

JAPANESE-MAURITANIAN FISHERY TALKS FAIL AGAIN

Negotiations to allow Japanese trawlers to fish inside Mauritania's 12-mile fishery zone were broken off for a third time this June. Japan had offered to pay entry fees according to the quantity of catch, but Mauritania wanted assessments based on vessel tonnage.

Since the difference between the two methods of assessment--against 69 Japanese vessels trawling off west Africa--would amount to US$1.9 million, the Japanese would not accept Mauritania's proposal. ('Suisan Keizai Shimbun,' June 24.)

INDIA

VESSEL MAKES RECORD LOBSTER CATCH

According to a report from Cochin, an Indo-Norwegian project deep-sea fishing operation made a record catch of spiny lobsters off Quillon recently. On a 2-day cruise, the fishing vessel 'Klaus Sunnana' caught up to 5 metric tons of lobsters in only 14 hours of fishing.

Fairly Large Quantities Found

A survey of the coast from north of Trivendrum to Cannanore has indicated fairly large quantities of shrimp and spiny lobster in 100 to 250 fathoms. Intensive fishing has been carried out in some of the grounds to find out their commercial possibilities. ('World Fishing,' London, July 1969.)

CEYLON

FIRST FISH CANNERY IS OPERATING

Ceylon's first fish-packing plant, 'Sesalai,' began operations on August 5. Built for about US$382,500, it employs 100 workers. The cannery capacity, which is about 28,000 cans per 8-hour day, packs small fish taken in coastal waters. Tuna will be canned in the future. ('Suisancho Nippo,' August 21.)

INDONESIA

FROZEN SHRIMP EXPORTS ARE DEVELOPING

Shrimp could become an important export commodity for Indonesia. Already it is a commercial catch along the east coast of Sumatra and the north coast of Java. But along the muddy coasts of Kalimantan (South Borneo) and West Irian (western New Guinea), it is practically untouched.

Because proper collection facilities have been lacking, shrimp has never been major export item, with one exception: Requiring practically no more effort for foreign than for domestic sale, it is shipped in ice from some parts of Sumatra to Malaysia and Singapore.

Exports began in 1967, when exporters in Djakarta first succeeded in collecting standard sizes in sufficient quantities. Since then, frozen shrimp exporting has begun in other areas, for example, Central Java and North Sumatra.

INDONESIA (Contd.):

Fishing Areas & Supplies

Most of the export shrimp comes from the existing small fishing operations, but increasing competition has impelled some exporters to set up their own operations. Djakarta's supplies generally come from the Bay of Djakarta, Tjirebon, West Java, and Tjilatjap in Central Java.

Fishing Methods

The local fishermen use primitive gear--beach seines, push nets, or traps. Nylon gillnets have been introduced in Tjirebon, and their popularity is increasing rapidly. Trawling is still experimental, except in North Sumatra, where it is already a commercial operation. Most of the shrimp supplied to Djakarta is *Penaeus merguiensis* mixed with other varieties, such as tiger prawn *P. monodon*.

Handling & Transportation

The fishing grounds are so close to the landing places that shrimp usually are landed un-iced. As soon as landed, they are collected by the exporters, usually through intermediaries buying only the exportable sizes. Handling facilities are provided by the exporters. The shrimp are beheaded, washed, packed in ice in cases or baskets, and trucked to Djakarta. The 6-10 hour trips are made at night to avoid excessive heat.

Processing, Freezing & Cold Storage

After arriving at the Djakarta processing plants, the shrimp are dumped into washing tanks. Some processors ice the washing water to keep temperatures down. If the shrimp are heads-on, they are first beheaded; then, after being thoroughly washed, they are graded according to quality, species, and size. Each category is weighed into 2.2 kilogram (5 lbs.) lots and distributed to the packing tables. They are arranged in rectangular metal pans covered with perforated metal lids. After water has been poured through the holes into the pans, they are frozen at -20° C. (-4° F.) for 8-12 hours. After the frozen blocks are removed from the pans, each is placed in a plastic bag, and then in a carton. Six cartons go into one 13.6 kilogram (30 lbs.) masterbox. These go in cold-storage to await final sea or air shipment to Singapore, Hong Kong, Japan, and the U.S.

Quality Control

Fishery products for export, including shrimp, are inspected by government agents shortly before shipment. A certificate of quality is issued for those found fit for human consumption. They are graded "Excellent," "Good," "Fair," and "Poor," ratings roughly equivalent to "U.S. Grade A," "U.S. Grade B," "U.S. Grade C," and "Sub-Standard."

Future Developments

To export frozen shrimp requires freezing and cold-storage facilities. Such facilities still are underdeveloped in Indonesia, forcing shrimp exporters to establish new freezing and cold-storage plants. These indirectly benefit the whole fish-processing industry. The rush for exportable shrimp also has opened new shrimp fishing opportunities--development of more efficient fishing gear and methods, and exploration of new fishing grounds.

The participation of new private enterprises is also very important to the industry. Formerly, private enterprise was very reluctant to invest capital in the shrimp fishery.

(Text based on a note submitted to 13th Session of the Indo-Pacific Fisheries Council, Australia, Oct. 1958, by Soenjoto Darmaredjo, Institute of Fisheries Technology, Pasar Minguei, Djakarta.)

SOUTH PACIFIC

AUSTRALIA

INTENSIVE SHRIMP RESEARCH PROGRAM TO BEGIN

Australia has announced a major research program on shrimp to be undertaken by the Commonwealth Scientific and Industrial Research Organization (CSIRO). The ultimate objective is the fullest exploitation of the northern shrimp fisheries consistent with conservation. It will involve about A$600,000 in capital expenditure over 3 years and, when in full operation, a recurrent yearly expenditure of about $330,000.

Gulf of Carpentaria Shrimp Fishery

Six years ago, the Commonwealth, the Queensland government, and commercial fishermen began the investigations that led to the discovery of great quantities of shrimp in the southeastern Gulf of Carpentaria. Commercial exploitation, first by Australian and later by foreign fleets, soon produced an annual harvest of millions of pounds.

Catch Decreased in 1968

After a record catch in 1968, the yield decreased considerably in 1969. Reasons for the decrease are unknown, but some other countries also reported a bad season. Only a carefully planned research program can determine the true cause of such dramatic fluctuations. More must be learned about the factors influencing population size, particularly the rate of natural replenishment and the impact of commercial fishing.

CSIRO's Program

CSIRO will begin with a size and age composition study of individual and collective shrimp catches. Individual specimens will be tagged to chart movements to and from the fishing grounds. Oceanographic researchers will study the effects of ocean currents and seawater changes on migration in different areas and seasons. Species studies will include investigations of growth, reproduction, behavior, the factors influencing food supplies, and the effect of different fishing intensities. ('Australian Fisheries,' July 1969.)

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SETS UP FISHERIES RESEARCH FUND

Australia is establishing a Commonwealth Fishing Industry Research Trust Account similar to the ones for the wheat, wool, dairy, meat, tobacco, and egg industries. The initial annual Commonwealth contribution will be about A$500,000. Each State will name its own trust fund to receive industry contributions for fisheries research within the State.

Advisory Committee

A Fishing Industry Research Committee--one representative from the Department of Primary Industry, one from the Commonwealth Scientific and Industrial Research Organization (CSIRO), and one from the Fishing Industry Council--will advise the Minister for Primary Industry on expenditures from the account.

Some programs the fund might support are: biological research--distribution, behavior, sustainable yields--and fishing regimes for particular stocks; technological research to improve exploiting, handling, and processing methods; economic and market research; extension of research results to the industry; vocational training and technical education. Each one would contribute to overall fisheries development. The fund also would support direct development projects: for example, demonstrating prototype equipment, exploratory fishing, and developing new products.

Scope of Fund

Any type of program connected with the fund's purposes will be considered. Fund money will be spent for the benefit of the Australian fishing industry as a whole, rather than for a particular section. The fund will not be used to finance purchases of plants and facilities, nor will it finance projects in the external territories. ('Australian Fisheries,' July 1969.)

AMERICAN SAMOA

TUNA PRICES UNCHANGED IN SEPTEMBER

September tuna prices in American Samoa carried over from August: $430 a short ton for frozen round albacore, $415 iced; $347.50 for frozen gilled-and-gutted yellowfin, $327.50 iced. ('Katsuo-maguro Tsushin,' Sept. 4.)

AFRICA

SOUTH-WEST AFRICA

STRICTER CONSERVATION MEASURES ANNOUNCED

A South-West African government official has announced stricter conservation measures for fish resources, including a closed season from November 1, 1969, to January 31, 1970. Beginning in fall 1970, the closed season will run from the end of October to the beginning of February of the following year.

He also warned vessels encroaching on the 12-mile fishing limits that patrol services will be strengthened.

The government also has decided to tighten spiny lobster catch limits. ('The South African Shipping News and Fishing Industry Review,' Sept. 1969.)

SOUTH & SOUTH-WEST AFRICA

FISH OIL PRODUCTION & EXPORTS, FIRST-HALF 1968-1969

	PRODUCTION		EXPORTS	
	1968	1969	1968	1969
	.... (Metric Tons)			
January......	5,187	2,537	14,446	-
February.....	9,258	9,211	4,293	6,101
March......	14,008	9,101	5,012	-
April.......	15,069	13,027	2,280	19,413
May.......	16,812	14,917	16,000	3,378
June.......	18,114	21,067	18,289	6,488
Total....	78,448	69,860	60,320	35,380
(Source: U.S. Consul, Cape Town; South African Fish Meal Producers' Association.)				

SOUTH AFRICA

SOUTH AFRICAN COMPANY ENTERS ANGOLAN FISHING INDUSTRY

A South African company, Pescangol (Pty.) Ltd., is planning to develop a small uneconomic Angolan fish-meal factory into a profitable operation. Through an Angolan subsidiary, Investimentos Sul Africanos de Angola, the company has bought a 75% interest in the ailing Unipesca S.A.R.L. Pescagnol agreed to pay about US$71,000 demanded by Unipesca's bankers, reducing its overdraft by one third.

Previous S. African Ventures

Pescangol now will have what promises to be a lucrative share in the underdeveloped, but potentially rich, Angolan fishing industry. The industry has tempted South Africans before. Several were forced to drop plans for Angolan subsidiaries some years ago after Portuguese legislation prohibited foreign control of Angolan fishing ventures.

Pescangol seems to have found a loophole: a group of South-West African farmers obtained a 90% interest in Unipesca just a few months before the law. They converted the company from trawl to shoal fishing, and installed an old 7-ton-an-hour fish-meal plant. These changes were insufficient for a profitable operation, and debts began to mount. This opened way for Pescangol's take-over.

To Renovate Company

Pescangol will replace 3 shoal-fishing boats with 70-80 vessels now on order from a Luanda boat builder. All boats will be fitted with radios, still new to Angolan vessels, power blocks, and echo-sounders.

Pescangol also plans to build a 30-ton-an-hour fish-meal plant; one quotation has been received from a Norwegian manufacturer. Unipesca already has its own jetty. The fish will be unloaded by pump.

To Expand Production

After the plant is commissioned in 1970, raw-fish intake should rise to 40,000 metric tons; 26,000 tons are planned this year. Unipesca has averaged only 15,000-18,000 tons since 1965. ('The South African Shipping News and Fishing Industry Review,' Sept. 1969.)

CATFISH

Whoever heard of fish that feed themselves? A major food company now markets a mechanical feeder that catfish trip when they get hungry. It's all part of the South's newest industry--catfish farming!

According to Dr. Jack Greenfield, Industrial Economist with BCF Ann Arbor, Michigan, about 12 million pounds of farm-raised catfish worth $4.6 million were harvested during 1968. Production in 1969 may be double, he says; by 1972 it could be 52 million pounds. Catfish are being grown in 25,000 acres of ponds. Mississippi (9,000), Arkansas (7,600), and Louisiana (2,700) lead in acreage and production.

Fig. 1 - Just about market size, this catfish soon will be on its way to a catfish-processing plant. BCF has developed a full-color cookbooklet called "Fancy Catfish," available from Government Printing Office. (Photo: Arkansas Game and Fish Commission)

The Catfish Market

Walter Jones, Regional Marketing Coordinator at BCF Ann Arbor, reports that most of the 1968 catfish were marketed locally as live or dressed fish to fish markets, individuals, and restaurants. Some catfish also were marketed as live fish to operators of pay-fishing lakes. The markets are changing rapidly, however. This year, there are at least 5 plants in the South processing catfish into a dressed, frozen product for distribution to restaurants, supermarkets, and other outlets throughout the U.S. Several franchised restaurants specializing in catfish also have been opened.

Fig. 2 - Catfish farms now form geometric patterns across the Southern United States.

BCF is providing technical assistance and information on plant design and sanitation for new processing plants.

Grown in Ponds

Jim Ayers, BCF Fishery Marketing Specialist, Little Rock, Arkansas, explains that most catfish are grown in ponds ranging from a few acres to 40 acres or more. Ponds are filled with 3 to 6 feet of water and stocked with 1,000 to 1,600 fingerling catfish per acre. They are fed a pelleted feed (many companies market commercial catfish feeds) for a year or more until they reach the popular market size of 1 to $1\frac{1}{2}$ pounds. Production per acre ranges from 1,000 to 2,000 pounds and averages about 1,400 pounds. Although several species of catfish are being grown, the most popular is the channel catfish (Ictalurus punctatus).

Fig. 3 - Everyone wades in to load catch after BCF biologists give a catfish-harvesting demonstration. At Bureau's Gear Research Base in Kelso, Arkansas, biologists are searching for quicker, more efficient methods of harvesting.

A big problem is harvesting the fish, says Don Greenland, BCF Gear Research Base in Kelso, Arkansas. A Base-developed mechanized haul seine harvests effectively many catfish ponds. He says that one of the Base's primary objectives is to improve and modernize harvesting methods. BCF demonstrations are given throughout "catfish country" to familiarize farmers with techniques and gear. The results are good: Several farmers have obtained similar gear.

Why Catfish?

Why are farmers converting some acreage to catfish farming? Catfish are popular in the South for their excellent eating qualities, says Walter Jones. More important, catfish can produce profits equal to, or higher than, soybeans, cotton, or rice; they are worth more per pound (35¢ to 45¢ and higher) than cattle, pork, or poultry. Demand also has been good.

With all the interest in catfish farming, a new organization, Catfish Farmers of America (CFA), was formed to bring order and unity to the industry. The CFA drew up stringent guidelines for their members. "Quality and continuity of supply are our watchwords," says President Charles Pickering. The organization has asked BCF to develop quality control standards.

The prospects for fish farming are good. As farmers gain experience and try new methods, greater efficiency and lower product costs will be realized. Many species of fish and shellfish can be grown successfully in fresh or saltwater ponds. The potential for diversification is excellent. Genetic breeding for faster-growing and more meaty fish offers new possibilities.

Problems May Develop

The future is not cloudless. Overexpansion and overproduction are definite possibilities during the next few years. Although BCF marketing specialists are trying to introduce catfish in other areas, the catfish image outside the South is not always good--and may not be changed easily. Some resistance also is being encountered to present prices of farm-grown catfish. Competition from foreign and cheaper production along the Gulf Coast may occur.

BCF is working with the industry to overcome the problems. Some of its specialists believe the catfish farming industry will become a significant new source of fishery products for U.S. consumers. (National Marketing Services Office, Bureau of Commercial Fisheries, United States Department of the Interior, 100 East Ohio Street, Room 526, Chicago, Illinois 60611.)

THE WAY OF ALL GIANTS?

A century ago lobsters sold for 2¢ a pound and were so common they were sometimes used as fish bait. Better transportation and refrigeration have drastically changed this, and fishing pressure has become intense. Dockside prices for lobsters are 80¢ a pound or more.

Vessels are now fishing in the deep offshore waters, where giant 20-30 pound lobsters are found, according to Bernie Skud, Director of the BCF Biological Laboratory in Boothbay Harbor, Maine. The offshore catch used to be less than one percent of the total lobster catch. Now, however, the offshore fishery is growing rapidly; it provides almost a fifth of the U.S. catch. Although the inshore fishery of New England still produces most of the world's supply, BCF, as early as 1965, became concerned that the two fisheries might be competing for the same supply of lobsters. Like any other crop, the lobster has an upper limit of harvest; go beyond that limit and everyone suffers--fishermen, processors, and the consumer.

Coastal & Offshore Fisheries Compete?

To determine if the coastal and offshore fisheries do compete for the same supply of lobsters, BCF established an intense research program at its Boothbay Harbor Laboratory. The program had several objectives. One was to establish a management plan for each fishery to secure the maximum catch possible without jeopardizing the lobster fishery. Another was to study the possibility of lobster farming. Skud says: "We think, on a high-priced product such as lobsters, that a company could farm them, make a nice profit, and still not compete with the commercial fishery. The supply to the consumer would, of course, also be increased; who knows, maybe we could all afford to eat lobsters."

Tagging Studies

To study the movements and interchange of lobsters in the inshore and offshore fisheries, BCF began a series of tagging studies. The early tags were attached directly to the armor-like shell-covering. However, these tags were lost when the lobster moulted. A small, harmless, yellow tag, retained through moulting, was developed later by Bureau scientists.

A small, harmless, yellow tag is used by BCF biologists to determine movements of lobsters on inshore and offshore fishing grounds. Through research, the biologists hope to develop a tag that stays attached even when the lobster casts its shell. These studies will provide data necessary to properly manage the important lobster fishery.

Since 1966, nearly 10,000 lobsters have geen tagged and released on the coastal and offshore fishing grounds. Those recaptured by fishermen showed that lobsters in the coastal areas remained in their chosen territories; in the offshore areas, however, lobsters moved long distances: one-third of those tagged moved over 50 miles, and one lobster traveled 185 miles in 70 days!

These tagging studies will soon tell BCF scientists whether the offshore fishery can be expanded without hurting the inshore fishery. "If we can, it will mean more lobsters for the fishermen and for the consumer," explains Skud. "Further development and added fishing pressure will undoubtedly spell the end of the giant lobster era. But that is inevitable in any productive fishery--and is the way of all giants."

Other research designed to preserve the multimillion dollar industry includes an analysis of the yearly growth of the offshore fishery; studies of the structure, growth, blood, and tissues of lobsters to learn whether separate groups inhabit the different fishing areas; and oceanographic studies to help determine what the lobster requires of its environment. An artificial reef was also constructed; BCF SCUBA divers have made new observations about lobster behavior.

Lobster History

The American lobster is called Homarus americanus to distinguish it from all other species, variously known as spiny lobster, langusta, and rock lobster. In 1968, for the first time, it provided the U.S. with the world's most valuable lobster fishery.

An organized fishery for lobsters began in Eastport, Maine, in 1843, when the canning process was developed. Most of the product was exported. The fishery was carried out among the rocks and ledges of the New England coast; the lobsters were caught in traps resembling orange-crates. Today, the traps are much the same as they were then, but the dories and pea-pods have given way to power boats.

Lobster Habits

Lobsters are commonly found on rocky areas of ocean bottom, hiding in excavated burrows under rocks. Occasionally, they hide amongst attached algae in shallow water, or in shallow depressions in a mud or sand bottom. Competition for hiding places exists with several species of crabs and finfish. Lobsters will utilize artificial cover such as tires, cement blocks, and tiles. Territoriality is practiced during the warmer two-thirds of the year and is virtually nonexistent during the winter. The act of shedding is performed in or close to the burrow and requires 10 to 20 minutes to complete. The cast-off shell is soon eaten by the lobster.

During the first several years of life, lobsters spend most of their time within the burrow complex. At age 3 or 4, the lobster begins to roam over the ocean bottom at night, leaving the burrow at sundown and returning before sunrise. These nocturnal movements are in search of food and generally do not cover more than several hundred yards. The lobster eats practically anything and, occasionally, eats the shells of other organisms. Predation on the lobster occurs primarily at night; sculpins, cunners, wolffish, goosefish, and cod have been observed stalking and capturing lobsters. The main defense of the lobster is his relatively large claws, a ripper claw, and a crusher claw. Lobsters missing one or both claws are less active. (National Marketing Services Office, Bureau of Commercial Fisheries, United States Department of the Interior, 100 East Ohio Street, Room 526, Chicago, Illinois 60611.)

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HOW DEEP HAS A SKIN DIVER GONE?

The greatest depth to which a diver has ever descended without a pressure suit was reached in December 1962 when Hannes Keller, a Swiss mathematician, and Peter Small, a British journalist, descended to 1,000 feet in an open diving bell. At that depth, Keller swam outside for 3 minutes. He breathed a secret mixture of gases which was based on his own computations of what the human system requires and can tolerate; he also computed the decompression stages for the diver. Unfortunately, Small and another diver died during this attempt.

The deepest dive without breathing aids, mask, or fins was made in February 1967 by Robert Croft, a U.S. Navy submarine escape instructor. He carried a 29-pound weight and reached a depth of 212.7 feet. His unusual ability can be attributed to the fact that he had rickets in his childhood, which resulted in a flexible rib cage and a lung capacity about twice the normal. ("Questions About The Oceans," U.S. Naval Oceanographic Office.)

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UNITED STATES DEPARTMENT OF THE INTERIOR

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Russell E. Train, *Under Secretary*
Leslie L. Glasgow, *Assistant Secretary*
for Fish and Wildlife, Parks, and Marine Resources
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As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."
The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States -- now and in the future.

BACK COVER: A cloud of rainbow trout streams from plane passing 300 feet above Wahweap Bay on Lake Powell, Colorado. (Photo: Mel Davis)

COMMERCIAL FISHERIES Review

VOL. 31, NO. 12 DECEMBER 1969

COVER: A crab processor and catcher boat anchored off BCF Biological Laboratory, Auke Bay, Alaska. (Photo: J. M. Olson)

COMMERCIAL FISHERIES
Review

A comprehensive view of United States and foreign fishing industries--including catch, processing, marketing, research, and legislation--prepared by the Bureau of Commercial Fisheries.

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Associate Editor: Barbara Lundy

Production: Jean Zalevsky
Alma Greene
Mary Andrews

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Throughout this book, the initials BCF stand for the Bureau of Commercial Fisheries.

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Horn Island, part of Gulf Islands in Gulf of Mexico off Texas. (National Park Service, M. W. Williams)

INTERIOR SEEKS COASTAL-ZONE LEGISLATION

The Department of the Interior has asked Congress to establish a new national program to encourage and help coastal and Great Lakes states to protect and develop their estuarine and other coastal lands and waters. The proposed legislation is based on a 3-year Estuarine Pollution study recently completed by Interior's Federal Water Pollution Control Administration.

The legislation would authorize matching Federal grants to coastal and Great Lakes states to develop comprehensive management programs for their coastal zones. These programs would follow guidelines that are established to promote the national interest. Follow-up matching Federal grants would be provided the states to carry out the plans.

The Estuarine Study reveals that long-range land and water management is mandatory to balance increasing demands on the vulnerable estuarine waters and wetlands.

Irreplaceable Areas

Secretary of the Interior Walter J. Hickel said: "Our coastal and estuarine areas contain irreplaceable habitat for most of our sport and commercial fisheries, as well as waterfowl and other wildlife. These areas are used for recreation and enjoyment by millions of people, and the demand is rapidly increasing.

"But it is here where our population and technological pressure are the greatest. Consequently, these resources are susceptible to man's alterations, such as pollution, housing and industrial development, which continue without a comprehensive plan on a piecemeal basis.

"The legislation would assist and strengthen the role of the coastal states in the orderly planning of their land and water resources of the coastal zone."

$2 Million U.S. Grant

Under the legislation proposed by Interior, the Federal Government would be authorized to grant, on a matching basis, $2 million for fiscal year 1971. The U.S. also would make available "such sums as may be necessary for the fiscal years thereafter prior to June 30, 1975" to assist states in developing comprehensive coastal zone management programs. (See Gulf Coast, pages 11-15.)

UNITED STATES

TEKTITE II IS SCHEDULED FOR SPRING 1970

The most ambitious underwater exploration program ever attempted--Tektite II--was announced on Oct. 31, 1969, by Secretary of the Interior Walter J. Hickel. More than 50 scientists and engineers, including some from abroad, will spend varying periods in the ocean over a 7-month span.

The operation will begin spring 1970 off St. John, U.S. Virgin Islands. This was the site of Tektite I, Feb. 15-Apr. 15, 1969, in which four Interior Department scientists spent a record-breaking 60 days living on the ocean floor.

Cooperative Effort

Tektite II will be a cooperative effort of government and private organizations. The lead agency will be Interior. Others include: the National Aeronautics and Space Administration, the National Science Foundation, the Department of the Navy, the Government of the Virgin Islands, the Smithsonian Institution, Public Health Service, the U.S. Coast Guard, and the Environmental Science Services Administration. Universities will participate: New Hampshire, Texas, Rhode Island, and the College of the Virgin Islands.

The General Electric Company, which designed and built the Tektite habitat, is providing it again. GE will furnish engineering support.

Vital to U.S.

Secretary Hickel said: "The Department of the Interior intends to play a major and active role in exploring and developing our Nation's marine resources. It is vital to the United States' continued growth and development that the secrets locked in this last frontier of our planet be uncovered and fully developed and utilized to meet many of the pressing demands of the future."

Study Ocean & Man

The Tektite II program will include a major marine scientific mission and extensive human behavioral studies. As in Tektite I, special emphasis will be placed on the behavioral and biomedical problems of small crews living in isolation for long periods under stress. These are the conditions that may be encountered in space and undersea exploration.

New equipment and techniques will be developed and evaluated for increasing man's undersea performance: oceanographic instrumentation, underwater communications and navigation equipment, swimmer propulsion systems, and long-duration, closed-cycle SCUBA devices.

The Habitat

The main 2-story undersea laboratory-dwelling will be 50 feet down. A smaller 2-man habitat at 100 feet will determine whether nitrogen/oxygen breathing mixtures can be used safely there.

U.S. FISHERY PRODUCT CONSUMPTION IS STABLE

At the end of September 1969, U.S. supplies of edible fishery products were about the same as a year earlier. Larger frozen stocks at the start of 1969 and heavier imports are offsetting a probable decline in domestic landings of edible fish. Per-capita consumption in 1969 likely will equal 1968's 11 pounds. Of this figure, about 6 pounds will be fresh and frozen, $4\frac{1}{2}$ pounds canned, and $\frac{1}{2}$ pound cured products.

Inventories Slightly Lower

November 1969 inventories of all frozen fish and shellfish combined were 4% below last year. They dipped below year-ago levels for the first time this year in September. Holdings of fish are down 10%, but shellfish are 13% above 1968. November 1969 inventories of fish sticks and portions were down 17%, mainly because sales in first-half 1969 were 28% greater than 1968.

More Shellfish Stocks

Larger stocks of shellfish resulted from sluggish sales reflecting consumer resistance to higher prices in 1969. Retail prices for all fishery products have been running 4 to 5% above a year earlier. The increase is less than that of meat and eggs--but larger than for most other foods.

Wholesale Price Higher

Wholesale fish prices have been running 10% higher than a year ago. Wholesale prices for fresh and frozen fish and shellfish are averaging 15% higher; prices for some canned products are averaging a fraction below last year. Fish sticks and portions--and cod and ocean-perch fillets--are among the few fresh and frozen items whose prices have not advanced much.

Imports Higher

Imports of edible fishery products through August 1969 were 4% above a year earlier. Imports of fish fillets rose 16%. Imports of frozen tuna were about the same as 1968; imports of canned tuna increased nearly a fourth. Imports of shellfish also were higher, sparked by an 8% increase in shrimp.

New England Landings Drop

Landings of edible fish in New England through September 1969 were 15% less than in 1968. Among the popular varieties, flounder landings were up slightly. Cod increased 17%. More than offsetting these increases were declines of 37% for haddock, 8% for ocean perch, and a more than 50% drop in whiting catch.

Forecast Through Dec. 1969

BCF economists provide this forecast for major fishery products for the remainder of 1969: Supplies of most fishery products are expected to be ample, although price levels, in general, will be higher than last year. Supplies of fresh and frozen salmon and Pacific halibut will be heavier than in 1968. Domestic production of canned tuna may be off a little. Inventories of frozen crabs are considerably above a year ago. These resulted in some price weakness recently for all varieties of West Coast crabs. Prices for live lobsters likely will average higher than a year ago; supplies will be about the same. Supplies of haddock will remain relatively short and prices higher than a year earlier. Supplies of cod fillets will be heavier than a year ago and prices about the same as in late 1968. Supplies of flounder and ocean perch fillets likely will be a little larger and prices higher.

SITUATION & OUTLOOK: SHRIMP, SEA SCALLOPS, NORTHERN LOBSTERS, SPINY LOBSTER TAILS

SHRIMP

Supplies of shrimp are running a little heavier than a year ago, BCF economists report. Total landings are higher than a year ago and may pass the record landings of 1967. At the end of October 1969, landings in the Gulf States were 8% behind October 1968. However, this decline was being offset by higher landings in the South Atlantic States, New England, and on the West Coast.

A bucket-load of Kodiak-caught shrimp is dumped in a processing plant container. (BCF-Alaska photo: J.M. Olson)

Imports

In the first 10 months, imports were about 5% above a year earlier. Imports for 1969 probably will set a new record at close to 220 million pounds, heads-off weight.

Fresh & Frozen Shrimp

Sales of fresh and frozen shrimp dropped sharply--about 7%--during the first 10 months of 1969. Total sales of fresh and frozen shrimp likely will be 15 to 20 million pounds, heads-off weight, lower than last year. The sales decline probably is the result of these factors: (1) record high prices, (2) no gain in "real" disposable personal income in 1969 after allowances are made for inflation, and (3) little growth in restaurant sales.

Inventories Rise

Inventories are considerably above a year ago because sales dropped while supplies increased slightly. Cold storage holdings on January 1, 1970, probably will be higher than this year's carryover and may be slightly higher than the record inventory at the start of 1968.

With record prices at all levels, no gain over a year earlier was expected in sales of fresh and frozen shrimp during November-December 1969 if prices remained at mid-November levels. A slight drop in sales from last year may be in prospect.

In light of the current inventory and sales situation, price strength does not appear likely except, possibly, for larger-sized shrimp. Even if prices hold steady at current levels, they still will average considerably higher than in November-December 1968.

SEA SCALLOPS

Total supplies are down 15% from a year ago. The general decline in abundance of northwest Atlantic sea scallops continued in 1969. Landings in New England are the lowest since 1945. Landings in Middle Atlantic and Chesapeake Bay States are much below a year ago. Scallop landings in Alaska have not been large enough to offset the East Coast deficit. Scallop landings in Canada and, consequently, scallop imports are down about 10% from January-October 1968.

Consumption of sea scallops also is down about 15%. Demand for sea scallops has not declined in 1969 even though consumption fell considerably. Lower supplies and higher prices caused the drop in sales. Because of this drop, prices for sea scallops at all levels have risen sharply since midyear 1969; currently, these average considerably higher than a year ago.

Though a drop in sales was expected during November-December 1969, compared with a year ago, inventories on January 1, 1970, probably will be lower than at the start of 1969.

Prices for the rest of 1969 will average much above a year ago and will continue high in the early months of 1970. Scientists expect abundance to continue low--so the prospect for increased domestic landings of sea scallops in 1970 is not bright.

NORTHERN LOBSTERS

Landings in Maine are down a little this year, but the decline probably is being offset by increased landings from offshore areas where lobster pots are being fished. Total landings for 1969 likely will be about the same as 1968. Imports from Canada also are about the same as a year ago.

During January-September 1969, prices paid to fishermen and at wholesale averaged nearly the same as in 1968. Prices are higher now and are expected to remain above year-ago levels for the rest of 1969. Prices for 1969 will average higher than a year ago--the effect of strong demand on a relatively fixed supply.

SPINY LOBSTER TAILS

Supplies of imported spiny lobster tails are slightly heavier in 1969 than in 1968. Imports were down a little for the first 10 months, but higher inventories account for the larger supplies.

Imports of cold-water tails are down considerably this year. As a result, warm-water tails have a much larger share of the market than in previous years.

The almost constant increase in lobster tail prices since mid-1967 halted in summer 1969. In first-half 1969, prices for cold-water tails were 90 cents to $1 higher than a year ago. Resistance to the price climb has been evident all year: sales have lagged 8 to 10% and inventories have mounted. Prices have dropped sharply since midyear--as much as a dollar per pound for cold-water tails--as efforts are being made to increase sales and decrease inventories before the seasonal upswing in imports at the beginning of 1970.

Supplies of lobster tails will be plentiful for the rest of 1969. Lower prices likely will increase the sales over November-December 1968. However, the January 1, 1970, carry-over in cold storage will be considerably above that at the start of 1969 and likely will be a record. With high inventories at the start of 1970, and seasonally heavy imports, relatively stable prices are in prospect for the early months of 1970.

FIRST TAGGED ATLANTIC SWORDFISH RECOVERED

The first swordfish ever to be tagged and recaptured in U.S. Atlantic waters was taken off Martha's Vineyard, Mass., reports the Sandy Hook Marine Laboratory (Highlands, N. J.) of Interior Department's Bureau of Sport Fisheries and Wildlife. When recaptured, about 48 miles east-southeast of tagging site, it had been at liberty almost 4 years--1,408 days. It weighed 356 pounds dressed; its total weight was about 535 pounds.

Montauk & Martha's Vineyard Sites

The swordfish was first caught and tagged on Aug. 25, 1965, 20 miles south of Montauk, N. Y. The tag was an M-type dart tag, a tiny stainless steel harpoon with a plastic message capsule attached. The fish was harpooned and recovered on July 4, 1969, about 40 miles south of Martha's Vineyard.

Swordfish Distribution

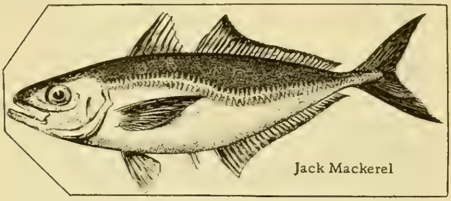
Swordfish are found throughout the world in tropical and temperate areas. They are recorded from Newfoundland to Cuba in the western north Atlantic. Present off the north Atlantic coast from late June or early July, they remain throughout the summer. Then they move south and offshore into deeper water along the edge of the continental shelf. Swordfish are sought by anglers and commercial fishermen using hook and line, harpoons, and longline gear.

World Record

The world's record hook-and-line swordfish was taken off Chile. It weighed 1,182 pounds. The largest taken in the western north Atlantic was 602 pounds. Swordfish taken along the Atlantic coast in recent years averaged 200 to 300 pounds, although several fish over 300 pounds were reported in 1969.

JACK MACKEREL'S SWIMMING SPEED IS DETERMINED

Dr. John Hunter of BCF's laboratory in La Jolla, California, has completed a study of the swimming ability of the jack mackerel. This medium-sized predator ranges over a million-square-mile oceanic region off the west coast of North America from Mexico to Alaska. It is an area as big as Alaska, Texas, and California combined.


Jack Mackerel

Dr. Hunter and his assistants worked with a flow channel he designed. This flow channel is the "wet" equivalent of a wind tunnel or treadmill. The major features of swimming behavior he studied were the frequency of the tail beat, the amplitude of the tail beat, and the relationship of these two factors to swimming speed and body length. He found a simple mathematical relationship among these factors that could be applied as well to many other kinds of fish.

Determining Its Speed

When swimming at a constant speed, the amplitude of the tail beat was a constant $\frac{1}{5}$ of the fish's body length. The tail of a ten-inch jack mackerel moves back and forth 2 inches. The swimming speed itself is a simple function of tail-beat frequency. When the tail beats 9 times per second, the 10-inch fish is propelled at 4 miles per hour (3.5 knots); when the tail beats 4 times per second, the fish moves 1.4 miles per hour (1.25 knots).

When changing speeds, the amplitude of the tail beat increases momentarily until the new constant speed is attained when the amplitude drops back to the constant $\frac{1}{5}$ body length and the tail-beat frequency characteristic of the new speed is retained. Tail-beat frequencies up to 25 per second were recorded, but no fish was able to keep a "pace" greater than 10 beats per second. At 8 beats per second, the fish could swim almost indefinitely.

Can Swim Far

It is now possible to illustrate how the jack mackerel may range over the 2000 x 500 mile area of the northeast Pacific. At the high cruising speed (4 mph), the jack mackerel could swim 1000 miles in about 11 days; at the lower cruising speed, the same fish would cover this distance in a month. Adult jack mackerel are about 20 inches long. They could easily range 1000-1500 miles between the breeding grounds off Mexico and the feeding grounds off Washington, British Columbia, and Alaska. If the jack mackerel had a good sense of direction, the entire 3000-mile round trip could be accomplished in about 45 days.

Speed Probably Geared to Food

An older generalization pertaining to all travel in air and water is that it takes about 4 times as much energy to travel at twice the speed. The swimming speed the jack mackerel uses when searching for food is probably geared to the amount of food the fish is likely to find. Schooling habits of the jack mackerel and their food will have to be studied to unravel this.

These basic swimming facts were applied to fish as widely different as a goldfish and shark. It appears that the simple mathematical relations developed from the jack mackerel study may bear on much wider swimming-speed problems. This generality may be sufficient for many questions about swimming speed. The estimates from such a generality will provide the starting point for more precise work on other species. Dr. Hunter's study will save much time, effort, and money in new research programs seeking to estimate and define swimming speeds.

BCF DISTRIBUTES ALASKAN FISHING LOG OF SCALLOP EXPLORATIONS

BCF's Exploratory Fishing and Gear Research Base in Juneau, Alaska, has made available to fishermen and other interested persons a fishing log of Alaska scallop explorations conducted in summer 1969. The explorations started west of Kodiak Island and extended westward along the southern coast of the Alaska Peninsula.

90-Day Scallop Explorations

On Aug. 19, 1969, the charter vessel 'North Pacific' completed 90-day scallop explorations to locate beds of commercial importance in this area. The cruise involved a search pattern of 646 stations at 5-mile intervals within the 25-60-fathom depth zone. Thirty-minute dredge hauls were made at each station using a standard commercial 13-foot, New Bedford-type, scallop dredge with 4-inch rings and using 1-inch cable.

Fig. 1 - Bags of iced scallops wait to be processed in this Seward, Alaska, processing plant.

Fig. 2 - Scallops are packed in 5-pound boxes at Alaskan Scallop Fleet plant in Seward.

Fig. 3 - Scallops are placed in refrigerated vans for shipment to 'south 48' (U.S.) via van ships.

(All BCF-Alaska photos: J. M. Olson)

NORWEGIAN HOLDING NET TESTED IN MAINE SARDINE FISHERY

Kenneth Sherman

Sardines (juvenile Atlantic herring, Clupea harengus harengus) with excessive amounts of food in their stomachs are not suitable for canning. In Maine, fishermen have traditionally used weirs and stop seines for catching sardines nearshore, and have had little difficulty in holding fish until they were sufficiently clear of food for canning. Since 1962, however, a purse seine fishery for sardines has grown rapidly. Purse seine fishermen, lacking the protection found in inshore waters, have been obliged to send their catches immediately to a cannery for processing. The incidence of fish that are unacceptable for canning because of a "feedy" fish condition is thereby increased; these fish are diverted for use as fish meal. Norwegian fishermen have solved a similar problem by designing a holding net for use in the open sea.

Norwegian Holding Net

The Maine Sardine Council invited Captain Arne Gronningsaeter of Landfast, Norway, to demonstrate the use of the Norwegian holding net to the Maine sardine industry. A sea trial of the net was made in September 1969 with a commercial purse seiner. The Bureau of Commercial Fisheries Biological Laboratory, Boothbay Harbor, Maine, cooperated in the trial by examining the changes of food content in the sardines during the holding period.

Captain Gronningsaeter instructed the captains and crews of Maine purse seiners in the handling of the holding net, which is available in a variety of sizes. The model used in the sea trial was 35 meters (115 ft.) long, 9 meters (30 ft.) wide, and 8 meters (26 ft.) deep. The netting on the sides and bottom is knotless nylon with stretched mesh of $1\frac{1}{8}$ inches. It is designed to hold up to 100,000 pounds of live sardines. In practice, the fish are transferred to the holding net immediately after they are purse seined and towed at 1 to $1\frac{1}{2}$ knots to a protected area. There, the net is anchored and the fish are left until cleared of food. The holding net in the anchored position is shown in figure 1.

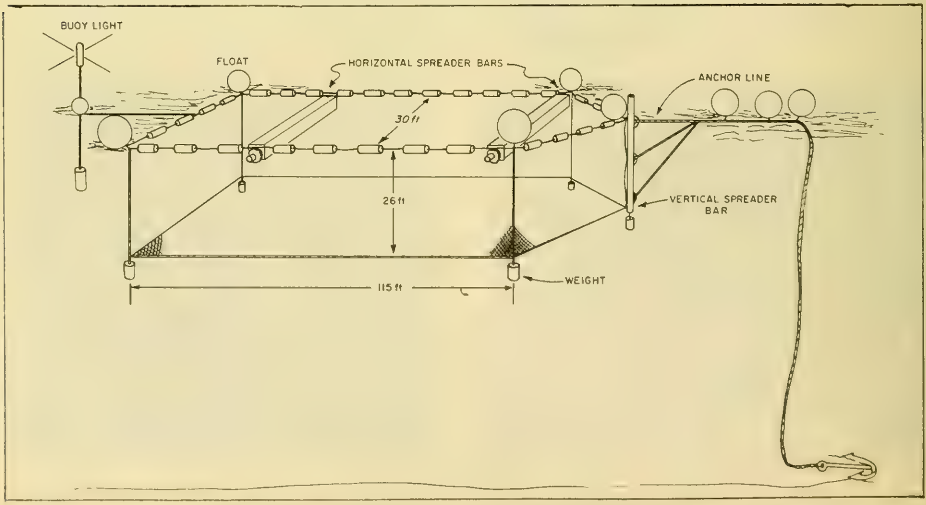


Fig. 1 - Drawing showing the holding net in the anchored position.

Mr. Sherman is Fishery Research Biologist, BCF Biological Laboratory, Boothbay Harbor, Maine 04575.

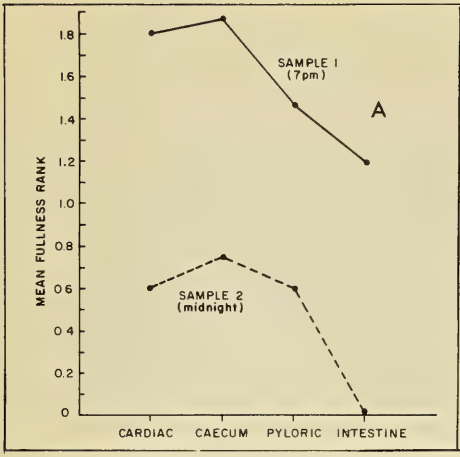


Fig. 2(A) - Comparison of the fullness rankings of the juvenile herring at the beginning of the holding experiment (sample 1 taken at 7 PM) and at the termination (sample 2, midnight). The values represent the mean rank of 10 fish selected from each sample. Rankings were made for major divisions of the digestive tract--the cardiac, pyloric, and caecal sections of the stomach and the intestine (O, devoid of recognizable food; 1, trace of food; 2, moderately full; and 3, moderately to completely full).

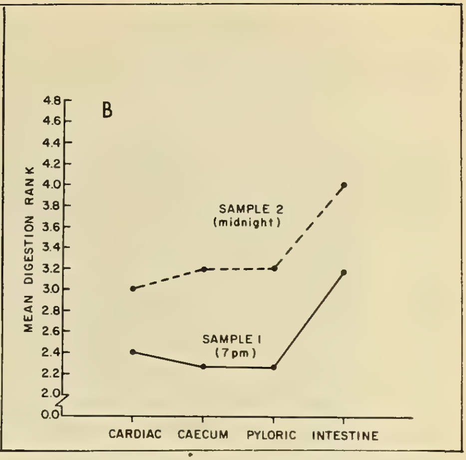


Fig. 2(B) - Comparison of the rankings of digestive stages of food in juvenile herring at the beginning of the holding experiment (sample 1) and at the termination (sample 2). The values represent the mean rank of 10 fish selected from each sample (1, slight digestion; 2, moderate digestion; 3, moderate to complete digestion; and 4, food liquified, with oil globules present).

Net's Effectiveness Tested

The effectiveness of the holding net for clearing "feedy" sardines was tested during a special cruise of the BCF research vessel 'Rorqual' on September 14 and 15, 1969. Determinations of the feeding activity of sardines in the net were made in cooperation with the purse seiner 'Eva Grace.' A set of about 37,000 pounds of herring was made by the seiner at 7 pm a quarter-mile east of Ragged Island, Maine (latitude 43°49.5' N., longitude 68°52' W.). The sea was calm and the quarter moon obscured by cloud cover. The fish (ranging in length from 213 mm to 247 mm) were sampled immediately after transfer to the holding net, and again at midnight just before they were pumped into the carrier.

Digestive Tracts Examined

The digestive tracts were examined in the laboratory. Contents of the stomach--including the pyloric, cardiac, and caecal sections--and intestine were examined under 25X to 600X magnification. Rankings were made of the degree of fullness and stage of digestion (Figs. 2A and B). The amount of food in the herring after they were held for 5 hours was considerably less than when they were seined (66% less in the cardiac stomach and no food in the intestine); food in the digestive tracts was also in the late stages of digestion when the experiment ended.

The alimentary tracts cleared significantly in the holding net. When seined, the fish contained remains that were predominantly copepods, the zooplankters that were also the most

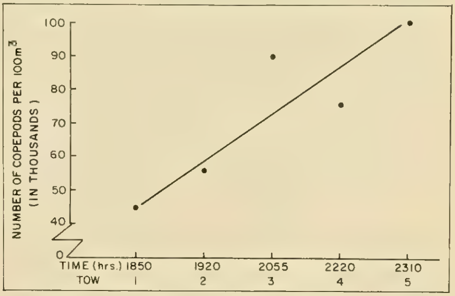


Fig. 3 - The number of copepods (per $100m^3$ of water strained) in the test area during the holding experiment.

Fig. 4 - The holding net under tow. (Photo: Gareth W. Coffin)

numerous in the test area. The numbers of copepods in the area increased from 7 pm to midnight (fig. 3), while the amount of food in the restrained fish was decreasing. The increase in abundance of zooplankton reflects the vertical movement of plankters to the surface waters in the evening, and to the lower depths in daylight.

The water mass did not change significantly during the experiment. Temperatures were between 12.8° C (55° F) and 13.0° C (55.4° F) at the surface and between 10.8° C (51.4° F) and 11.7° C (53° F) at the bottom. The bathythermograph traces showed no evidence of a thermocline. Salinity was 31.9 ‰ at the surface and 32.4 ‰ on the bottom.

Sardines in Good Condition

The sardines were in good condition at the conclusion of the experiment. No dead fish were observed in the holding net. By transferring the fish, the seiner was free to make an additional set, while enhancing the quality of the confined fish. The holding net under tow is shown in figure 4. Several sardine-plant owners have indicated that they will purchase holding nets for their purse seiners.

Whether the decrease in the feeding of sardines can be attributed to a stress condition imposed on the fish by the artificial confinement--or to the general decrease in feeding known to occur among herring during nights with weak moonlight--remains an open question requiring further study. The level of stress experienced by fish in a holding net is probably related to crowding, which will also result in a decrease in the availability of food to each fish. In addition, digestion is a function of temperature and the kind of food eaten. Clearing time during the colder months will be longer than at the higher temperatures in spring and summer regardless of stress. Within the framework of a controlled experiment, it should be possible to test effects of change in crowding, temperature, and food quality on clearing time.

THE GULF COAST: 1. DANGER IN THE ESTUARIES

NEW U.S. policy aims to promote development of coastal areas and the Great Lakes. The Coastal Zone of the Gulf of Mexico is an important part of this national goal. The October 1969 issue of 'Gulf Review,' published by the 18 Southern institutions of higher learning in the Gulf Universities Research Corporation, focuses on the Gulf.

"Estuaries and pollution have become inseparable in America's affluent society," the newsletter states. Each year in the U. S., public health officials condemn more shellfish water because of pollution than they reopen. Estuarine pollution is a very important matter in the Gulf Coast area, which produced more than 275 million pounds of shellfish in 1967.

Gulf's Shoreline 88% Estuarine

'Gulf Review' states: "The Gulf's 17,141 miles of tidal shoreline are 88 percent estuarine in character. Thirty-nine primary estuarine systems and 175 secondary-tertiary systems account for approximately 60,000 square miles along the Gulf. And these systems serve as receptacles for run-off from all or part of thirty-one states. Twenty-four U.S. trunk rivers, draining more than 1.5 million square miles of land, dump approximately 700 million tons of sediment into the Gulf estuarine environment. These rivers have an average total discharge amounting to 205.5 cubic miles of water which pass through the estuarine environment each year. The sediment and waters which eventually find their way to the Gulf carry with them chemical wastes, industrial pollutants, insecticide and pesticide residue, and myriad other man-produced toxins which threaten the life of the Gulf's estuaries.

"The effects of man have already begun to show up. The U.S. commercial catch of eight species of estuarine dependent fish in the Gulf and Atlantic coasts fell from 393 million pounds in 1955 to 291 million pounds in 1965."

Texas Pesticide Study

The Texas Parks and Wildlife Department has been studying pesticides, primarily DDT, since 1965. It has monitored most of the State's coastal bay system and taken random samples from the Gulf. Oysters, forage fish, game or predator fish, and shore birds have been included.

The highest residues have been found consistently in the Lower Laguna Madre. In forage fish samples, average DDT residues ranged from 0.173 part per million (ppm) to 3.275 ppm.

All oyster tissue samples averaged much less than 1 ppm DDT or other pesticides.

'Gulf Review' states: "Evaluation of the data taken during the study indicates that the impairment of reproductive ability and decrease in the survival of young are the greatest dangers to a species at the present time." DDT residues in the Texas study were "still much below the danger level." The newsletter notes that DDT has been banned in some parts of the U.S. because of its effects on the marine environment.

2. MARSHES & MARICULTURE

"Much of the coastal zone of the Gulf of Mexico is marshland. The Gulf's lowlands and deltas, fed by the discharge of 24 U. S. rivers, account for hundreds of thousands of square miles of the coastal zone. In this soft, wet, and often inundated land, tidal pools provide a breeding ground for marine life and establish a refuge for sea birds and other wildlife.

"Conservationists have long appreciated the vast desolation of the salt marshes but the interests of industry, agriculture, and other user groups have recently turned to this resource."

Pompano Research in Louisiana

Louisiana State University (LSU) and Texas A&M University (TAMU) are conducting Sea Grant-sponsored fishery studies in Gulf marshlands.

The LSU work has shown that pompano can live in water that does not have the high salinity content of their native ocean habitat. Pompano are growing in tanks with water of

salinity comparable to the brackish water of the Louisiana marshes.

LSU scientists believe the fish can be raised in brackish water ponds in the widespread Louisiana marsh. Pompano fish farms would develop--as with catfish. If the research shows pompano can be farmed successfully, "pompano crops may become an important new industry for the marsh country."

In the first experiments, pompano fingerlings placed in ponds did not grow to market size in a year. But the researchers are optimistic.

Texas Research on Shrimp Farming

Near Angleton, Texas, TAMU is experimenting with marsh use for shrimp farming. Researchers are developing manmade ponds in the boggy marsh.

Three natural marsh ponds were leveed and ten half-acre reservoir type ponds were built. In April 1969, 17,000 post-larvae brown shrimp averaging 8 mm were put in a $1\frac{1}{2}$-acre natural pond. Ninety days later, the shrimp had reached mean length of 147 mm; market value was 856 per pound.

In July, a harvest flume designed by the researchers collected the shrimp. The flume is a floodgate through which water is drained from pond. Shrimp are trapped in a net stretched across the flume. The brown shrimp were susceptible to the flume. They reacted as though they were returning to the Gulf on an outgoing tide.

Fish Predation A Problem

In the first experiment, the chief problem was that fish ate many shrimp. To evaluate effect of the fish predation, the natural ponds were stocked in August with juvenile white shrimp. A fish toxicant, rotenone, was applied to one pond. Diuron was used to control all aquatic vegetation. A commercial catfish food supplemented natural foods.

Early sampling showed survival in all ponds greater than in the earlier experiment. Where predators were eliminated, growth rate was highest. The researchers advise that an accurate measure of survival will have to wait the shrimp harvest.

BEFORE

AFTER

Destruction of valuable estuarine marsh by spoil from hydraulic dredging for real estate development. The mound in the right background is the discharge end of the dredge line. The widespread effect upon the marsh and water areas is readily evident.

3. CAMILLE: DEVASTATES GULF COAST

In early morning, Monday, Aug. 18, 1969, as Hurricane Camille's 200-mile-an-hour winds lessened, the U.S. Food and Drug Administration's New Orleans District put into operation its prepared plan to meet a natural disaster. All inspectors, chemists, sanitation engineers, and microbiologists were alerted for service. Other FDA districts sent specialists.

Using whatever means of communication were still working, FDA contacted State and local health and civil defense officials in Mississippi, Louisiana, and Alabama to determine the hardest-hit areas and the ways FDA could help.

The following are excerpts and photos from 'FDA Papers', October 1969, which tell part of the FDA operation following Hurricane Camille.

"After building steadily to full intensity for several hours, Hurricane Camille's Sunday punch came at 10 p.m. August 17, striking the Gulf Coast with unprecedented 200-miles-an-hour winds that continued unabating until 2 a.m. Monday. Although the entire coastal area felt some of the hurricane's impact, its biggest was against the coasts of Mississippi, southeast Louisiana, and Alabama, destruction by winds ranging in some places up to 200 miles inland. Along the Mississippi and Louisiana coasts tidal waves up to 20 feet high slammed impartially into the works of man and nature alike, destroying, flooding, and killing.

"Within 48 hours the same hurricane was to carry torrential rains as far as central Virginia, precipitating flash floods there that brought further death and destruction, before heading out to sea to die in the Atlantic.

"On the Gulf Coast the hurricane, its potential death toll kept down only by hurried, partial evacuation of the most dangerous areas, had left thousands homeless and jobless, had wiped out almost the entire economies of some cities that were built largely on seafood processing and the tourist trade, and had so flattened the mostly residential Mississippi city of Pass Christian that it was later almost entirely reevacuated of returning inhabitants. It had left almost all the immediate coastal areas without electric power,

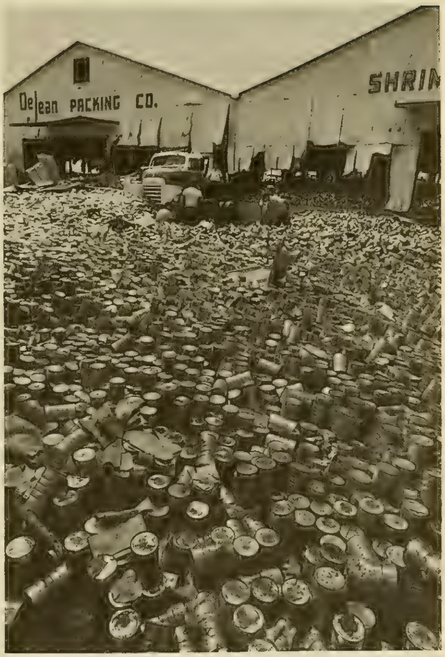


Fig. 2 - A field of cans: seafood and fruit drinks.

telephones, gas, passable roads and bridges, potable water supplies, workable sewerage, safe food, and adequate medical facilities and supplies.

"The winds and tidal waves had downed or defoliated trees small and large, had twisted steel and concrete structures and undermined pavements and seawall, and had even beached three oceangoing freighters docked and lashed together at Gulfport, Mississippi, along with many smaller vessels. In most areas waterfront structures were flattened or in ruins, including those of the extensive seafood packing industry along the coastline, where these products in cans were scattered and exposed to the elements and to hungry human scavengers.

"Flooded, mosquito-breeding areas, dispossessed rats, snakes, and other vermin,

Fig. 1 - One of shrimp trawlers beached by Camille.

Fig. 3 - Employes of seafood packing plants wash and sanitize cans in vast salvage operation. (All photos FDA)

and the unburied bodies of animals and humans, unfit drinking water, unrefrigerated perishable foods, the lack of public eating and sleeping accommodations, together with intermittent spells of rain and hot sun, posed the threat of famine and disease. Clearly, the hurricane had left in its wake a public health problem of the worst order, one that called for the utmost and combined efforts of State, local, and Federal health, law enforcement, and civil defense officials, the military, and the citizenry."

Seafood Inspection

FDA inspectors began the enormous job of checking, "street-by-street, door-to-door," seafood-processing and other food firms to see what foods could be saved and what had to be thrown away.

An FDA "reconditioning" team "kept watch over the operations of firms seeking to recondition products potentially fit for distribution into commerce. For canned seafood and other canned products, reconditioning consisted of sorting unlabeled cans by code numbers stamped on the can to identify the product, washing the can in detergent, and dipping it in a sanitizing bath. Cans beginning to rust were examined for pinholes and were required to be buffed to remove traces of rust. The reconditioning was a special problem because of the unavoidable exposure of the cans to the weather and the difficulty the firms encountered in finding qualified people to do the salvaging work. . .

"At the Port of Gulfport (Miss.) some 800 tons of fishmeal and a million one-pound cans of cat food were flooded, and FDA Inspectors maintained surveillance over destruction by burial of all but 100 tons of the fishmeal that was removed to Louisiana for reconditioning under an agreement reached between Mississippi and Louisiana State authorities."

1968 GREAT LAKES COMMERCIAL FISHERY PRODUCTION DECLINED

The 1968 catch by U.S. and Canadian Great Lakes commercial fishermen was 115.7 million pounds, about 12 million below 1967 but less than $300,000 lower in value. This was reported by the Great Lakes Commission.

The substantial catch decline was due primarily to a lower alewife harvest in Lake Michigan. Excluding alewife, the 1968 catch was up about 2.8 million pounds from 1967 due to Canadian gains. U.S. landings of species other than alewives were about 40 million pounds for both years.

Particularly important in Canada's harvest are landings of yellow perch and smelt. The 1968 catch of perch from Province of Ontario waters was a record. In 1967 and 1968, this species was about half total weight of Canadian commercial catch; smelt landings were a quarter.

20 Species Commercially Important

About 20 species are netted by commercial fishermen in significant quantities--50,000 pounds or more annually. But of this group, 10 species provide most of the production and income for U.S. fishermen; Canadian lake fishermen rely heavily on 5 species.

Below are figures compiled by BCF Ann Arbor, Mich.

Catch & Makeup Vary Widely

The commercial catch varies widely for the several lake basins in size and compostion. For combined U.S.-Canadian production, Lake Erie is normally the leader. But, in 1967, the top position went to Lake Michigan as a result of the exceptional catch of alewives; this brought Lake Michigan's share of Great Lakes total to 46%. However, the 1967 value of Lake Erie's U.S.-Canadian catch was $4.7 million, compared to slightly under $3 million for Lake Michigan.

In 1968, Lake Erie again became production leader. Catch rose to 51.3 million pounds, up 2 million over 1967; the lake remained first in value despite drop to $4.1 million.

	1967 (000 Lbs.)	1968 (000 Lbs.)	1967 (000 $)	1968 (000 $)
U.S. total	81,957	67,324	5,961	5,766
Lake Ontario	284	342	63	71
Lake Erie	11,615	11,921	1,326	1,165
Lake Huron	3,211	2,678	476	439
Lake Michigan	58,951	45,810	2,963	3,087
Lake Superior	7,895	6,573	1,133	1,004
Canadian total	45,646	48,340	4,834	4,746
Lake Ontario	1,832	2,010	243	284
Lake Erie	37,770	39,416	3,339	2,972
Lake St. Clair	810	1,122	200	271
Lake Huron	2,666	2,428	700	815
Lake Superior	2,568	3,364	351	404
U.S.-Canada total	127,603	115,664	10,795	10,512

	Pounds				Dollar Value			
	1967 (000s)	% of Total	1968 (000s)	% of Total	1967 (000s)	% of Total	1968 (000s)	% of Total
U.S. total	81,957	100	67,324	100	$5,961	100	$5,766	100
10-species	78,924	96	64,043	95	5,219	88	4,948	86
Alewives	41,895	51	27,194	40	447	7	280	5
Chubs	11,313	14	11,126	17	1,743	29	1,722	30
Carp	6,579	8	2,093	9	329	6	207	4
Yellow perch	5,778	7	5,267	8	715	12	621	11
Lake herring	3,831	5	3,663	5	433	7	423	7
Sheepshead	2,568	3	3,154	5	102	2	65	1
Smelt	2,776	3	3,115	5	95	2	98	2
Coho salmon	1,484	2	1,999	3	161	3	320	6
Whitefish	1,600	2	1,704	2	922	15	1,054	18
White bass	1,100	1	728	1	272	5	158	3
Canadian total	45,646	100	48,340	100	$4,834	100	$4,746	100
5-species total	39,588	87	42,265	87	3,983	82	3,846	81
Yellow perch	22,700	50	24,931	52	2,401	50	2,104	44
Smelt	12,660	28	12,490	26	508	10	486	10
Lake herring	1,924	4	2,715	6	90	2	166	3
Walleye	1,498	3	1,098	2	581	12	568	12
Whitefish	806	2	1,031	2	403	8	522	11

Canadian figures: Ontario Dept. of Lands & Forests.

Lake Michigan

In U.S. Great Lakes fishery, the Lake Michigan catch of 45.8 million pounds in 1968 was 68% of total compared to about 72% in 1967 record year (second table). The 1968 catch was nearly $3.1 million; it was the first $3-million year since 1958.

The Alewife

The alewife is found in all Great Lakes, but is sought by commercial fishermen only in Lake Michigan. There, the population recently became particularly high. In 1968, the catch was about 27.2 million pounds, or 14.7 million lower than 1967 record. However, it is a low-value species used for fish meal, oil, and pet foods. So this decline did not affect substantially the Lake Michigan catch value. In fact, the increase in dollar value of coho salmon, introduced into Great Lakes in 1966 and caught commercially only in Lake Michigan, was about equal to 1967-68 decline in value of alewife landings (first table).

The Chub

The chub is the most valuable commercial species in U.S. Great Lakes. Lake Michigan accounts for a large share. L. Michigan's yield rose from 9.1 million pounds in 1967 to about 10.2 million in 1968. For 1968, the value was $1.6 million, or 52% of total.

Yellow Perch

In contrast, the yellow perch catch in Lake Michigan presents a dismal outlook. The annual production of 4-5 million pounds in the early 1960s fell to new low of 632,000 in 1968. A significant cause was competition for food from the alewife, which has hampered perch in growing to marketable size.

OTHER LAKES

Lake Erie: U.S. catch in 1968 was only slightly above 1967's all-time low. Canadian 1967 & 1968 landings were among largest on record. This was due primarily to new yellow perch highs. This species ranks first in the commercial fishery on both sides of international boundary.

Lake Huron: U.S. landings were at a new low in 1968, only about half the early 1960s' figures. It was due to declines in some species--chub most noteworthy. Canadian production dropped substantially.

Lake Superior: The U.S. harvest in 1968 was lowest since early 1920s. This was due primarily to steady decrease in catch of lake herring: 3.7 million pounds compared to 10-11 million in 1950s. Canadian catch was highest since 1959.

Lake Ontario: The commercial fishery has remained stable. The annual catch usually amounts to somewhat over 2 million pounds. Canadian fishermen account for major share.

Lake St. Clair: The commercial fishery is limited to Canadian waters, where the harvest remains fairly stable. Walleye landings of 226,000 pounds in 1968 were worth close to half the dollar value of total catch.

FUR SEALS INCREASE AT CALIFORNIA ROOKERY

A new breeding colony of Northern fur seals on San Miguel Island off California has more than doubled since its discovery in July 1968 by scientists from the University of California and the Smithsonian Institution.

When the colony was found, there was a maximum of 86 fur seals. The herd was ruled by a lone "beachmaster," as a lordly breeding bull is called.

1969 Breeding Season

At the height of the breeding season in summer 1969, about 175 females were on the island. There were 4 adult bulls; 3 of them presided over harems.

There were fewer pups in 1969: only 26 compared with 36 in 1968. Reasons for the decline are unknown and BCF scientists will continue their study of the new colony.

Following their migratory habits, more than half the fur seals had left the island by early October 1969.

Fur seal bulls.

The Northern fur seal has a strong homing instinct. It usually returns to the rookery of its birth each year during the breeding season. Fur seals from other rookery islands were the main source of the increased population in 1969.

Santa Barbara Spill

Dr. Leslie L. Glasgow, Assistant Secretary of the Interior for Fish and Wildlife, Parks, and Marine Resources, said he was gratified to learn of the increased fur seal population. This was because of public concern for marine mammals expressed during the oil spill in Santa Barbara Channel in early 1969.

In June 1969, Interior Department reported no evidence that deaths of seals or sea lions on San Miguel Island could be attributed to oil pollution. In addition to fur seals, the island is inhabited by elephant seals, sea lions, some Stellar sea lions, harbor seals, and an occasional visiting Southern fur seal.

The Navy owns the island. Under an agreement with it, Interior's National Park Service has assumed responsibility for wildlife.

FISH SCHOOLS COUNTED BY SONAR FOR FIRST TIME

Fish schools were counted and measured in a 200,000-square-mile area off California and Baja, California, from BCF's 'David Starr Jordan.' This assessment of fish abundance is the first of its kind using sonar. The technique will yield a more exact assessment of the ocean's fishery resources.

A Million Schools

Data analyses indicate about one million schools of fish in the area. Most were about 66 feet in diameter, although a considerable number were much larger. A 66-foot school would yield an estimated 30 tons of fish. Many schools are probably young fish too small to catch. Other schools are northern anchovy, jack mackerel, bonito, Pacific mackerel and Pacific sardine of commercial size.

WOODS HOLE REPORTS ON 4-YEAR GAME-FISH TAGGING PROGRAM

Woods Hole (Mass.) Oceanographic Institution recently issued the results of a 4-year Cooperative Game Fish Tagging Program. The program's coordinator was Frank J. Mather III, Associate Scientist at the Institution.

Valuable information was provided by sport fishermen "leading to concern for the conservation of certain game fish species, primarily the bluefin tuna."

Biological Information Sought

The program's objectives are to obtain basic biological information that also can be used to manage fisheries. The game fish tagged are primarily tuna, marlin, sailfish, and amberjack. From 1965 until 1969, 18,193 fish were tagged--and 1,972 tags recovered and returned. Tagging exceeded the previous 11-year total of the program that started in 1954.

Mather says that "although the increased number of releases was very encouraging, the fivefold increase in the number of returns is much more important."

Bluefin Tuna

Bluefin tuna accounted for nearly 40% of all fish tagged and produced over 90% of the returns. This high return--plus a decline in commercial tuna catch--indicates bluefin stock is smaller than had been estimated and is being exploited very heavily. Based primarily on this program's results, FAO has recommended conservation of the species. It will discourage commercial fishing of bluefin weighing less than 22½ pounds. The newly formed International Commission for the Conservation of Atlantic Tunas, recognized by 16 nations, will have authority to enforce the measures necessary to conserve tunas and billfishes.

Long Migrations

Two long migrations of giant bluefin were recorded. One tagged in the Bahamas in May 1967 was recaptured 50 days later off Bergen, Norway. This brings to 6 the transatlantic migrations of giant bluefin recorded by the program. Also recorded were 34 migrations of school bluefin tagged off Long Island (N.Y.) and Cape Cod (Mass.) and recovered in the Bay of Biscay. The annual variability of these migrations has a potential effect on western European fisheries. No westerly transatlantic migration of tuna has been recorded.

The longest liberty of a tagged tuna was recorded in August 1968 at Cape St. May's, Nova Scotia: a bluefin tagged south of Nantucket in November 1960. The fish required 8 years to increase from about 100 pounds to

405 pounds. It indicates that Woods Hole estimates of time required to replace stocks of giant tuna (based on growth studies) have been conservative.

White Marlin

Important progress was made in tracing white marlin migrations. "A definite cyclical migratory pattern has been established for those which furnish the summer fishing between Cape Hatteras and Cape Cod." Sufficient white marlin are being tagged in this area, but Woods Hole urges increased tagging in southern waters to clarify population identity and migratory patterns of other stocks. The first two recoveries of tagged blue marlin indicate that these great fish also can be tagged successfully.

Atlantic Sailfish

Atlantic sailfish tagging numbered 3,833; 45 were returned. "Although less dramatic than those for tuna or marlin, the results are of considerable interest." A sailfish marked off Jacksonville, Fla., in June 1969 and recaptured off Fort Lauderdale, Fla., in October 1969 was first direct proof of southward migration. It showed need for increased tagging in northern Florida-to-Cape Hatteras area to supplement these studies.

Striped Marlin

Striped marlin tagging in the Pacific is carried on jointly with the Tiburon Marine Laboratory of the Bureau of Sport Fisheries and Wildlife. A recently recovered WHOI tag indicates one of the longest recorded migrations for this species. A fish tagged off Catalina Island, Calif., was recaptured 2,000 miles away, about 975 miles north of the Marquesas Islands.

Greater Amberjack

Return rates for the greater amberjack have risen within the past 4 years, but fishing pressure does not threaten total population. There were several new record long-distance migrations. The amberjack is a very hardy fish and the death rate due to tagging is low; for this reason, "interesting new results may be expected."

Program Objectives

Objectives of the Woods Hole program center on identifying populations and determining effects of fisheries on them, especially bluefin tuna. "Methods include increased tagging of baby bluefin tuna, particularly in southern waters, increased tagging of white marlin in southern waters, and of sailfish and greater amberjack in the northern parts of their ranges. Harpoon tagging of free-swimming fish appears to offer great possibilities for increased tagging of giant bluefin and swordfish."

FOREIGN FISHING OFF U.S., OCTOBER 1969

NORTHWEST ATLANTIC (Fig. 1)

During October, 256 individual foreign fishing and support vessels were sighted (340 in Sept. 1969; 177 in Oct. 1968). Number decreased from about 240 early in month to about 100 at month's end, a normal decrease for this season.

USSR: 62 medium side trawlers, 34 factory stern trawlers, 2 factory base ships, 6 refrigerators, 2 tankers, and 1 tug. Early in month, about 100 were along 30-fathom curve from 35 miles south of Shinnecock Inlet, L.I., to 30-40 miles south and east of Nantucket. At mid-month, from Cultivator Shoals to Northern Edge, Georges Bank; at month's end, about 60 vessels remained centered south of Martha's Vineyard and Nantucket. Principal catches were herring and mackerel (south of

Fig. 1 - Foreign vessels fishing off southern New England and Georges Bank, October 1969. Number of vessels, country of origin, and species fished.

Nantucket and on Georges Bank), red hake (south of Montauk Point, Long Island), and whiting.

Poland: 32 large side trawlers, 7 stern trawlers, 2 factory base ships, and 3 carriers (50 in Sept. 1969; 23 in Oct. 1968). Along Georges Bank from Cultivator Shoals to Northern Edge, early in month; east and south of Nantucket after mid-month. Moderate-to-heavy catches of herring and mackerel. Some red hake south of Nantucket.

East Germany: 32 factory and freezer stern trawlers, 11 side trawlers, and 2 factory base ships (50 in Sept. 1969; 38 in Oct. 1968). East of Cape Cod and Nantucket to northern slopes of Georges Bank early in month; none sighted late in month. Moderate catches of herring.

West Germany: 28 stern trawlers (29 in Sept. 1969; 35 in Oct. 1968). Fished same areas as East Germans early in month; none sighted late in month.

Spain: 24 stern and side trawlers, pair-trawling early in month; none sighted late in month.

Japan: 2 stern trawlers sighted among foreign fleets on Northern Edge of Georges Bank.

Iceland: 6 herring purse seiners that had been operating out of Gloucester, Mass., departed during first-half October.

Norway: 2 medium purse seiners and 1 large seiner, based at Gloucester, replaced Icelandic seiners. Herring catches were only fair. One large seiner on Georges Bank departed because of poor catches.

GULF OF MEXICO & SOUTH ATLANTIC

No foreign fishing vessels observed in October.

OFF CALIFORNIA

USSR: One medium trawler, about 20 miles out, near Oregon border. Catch: probably black cod or hake.

Japan: One stern trawler underway, not fishing. R/V 'Kaiyo Maru,' en route to Southwest Atlantic, called at San Diego, October 25-30.

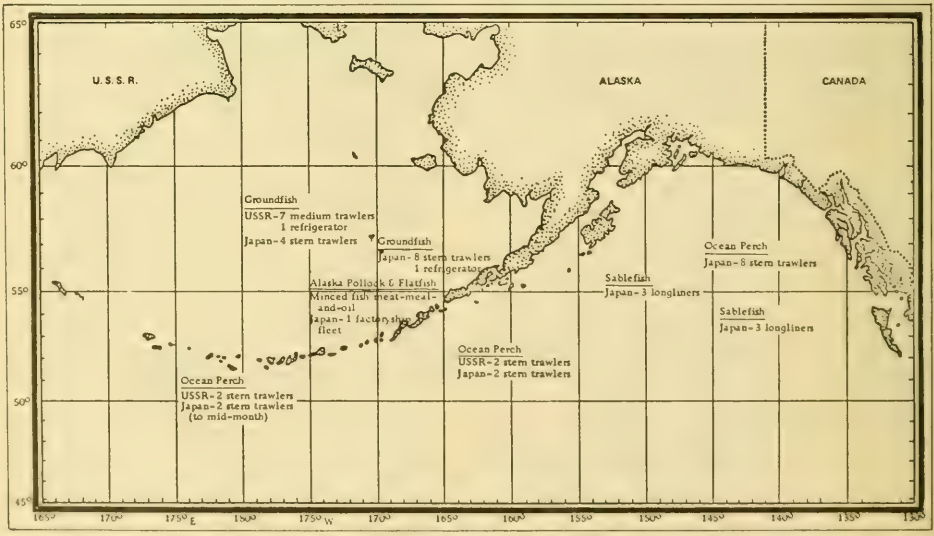


Fig. 2 - Soviet & Japanese fisheries off Alaska, October 1969.

Fig. 3 - Fishermen aboard BCF's 'Miller Freeman' operating in Bering Sea prepare to inspect their experimental drag catch as a Japanese fishing vessel crosses their stern. (BCF-Alaska photo: J. M. Olson.)

OFF PACIFIC NORTHWEST

USSR: 21 large stern freezer and factory trawlers, 1 medium side trawler, 6 support vessels, and 3 research vessels. About 10 stern trawlers 40 miles WNW of Destruction Island and 16-60 miles off Cape Flattery early in month (10-15 believed off Oregon). In 2nd week, 18 vessels between Yaquina Head and Cape Blanco off Oregon, a few off Washington, and a small group south of Vancouver Island on La Perouse Bank. After mid-month, about 25 vessels were off Oregon, and a few were scattered off Washington. Catches: Pacific hake.

The research vessels were from the Pacific Institute for Fisheries and Oceanography (TINRO). One, the SRTM 8437, was equipped with high-intensity lights, and may have been test-fishing Pacific saury.

OFF ALASKA (Fig. 2)

USSR: 12 vessels, less than half the number in October 1968, and as many as in July and August 1969 (17 in Sept. 1969); the fewest since Soviet year-round fisheries began in 1963.

Japan: The decrease that began in August leveled off in early October at about 40 vessels.

South Korea: A stern trawler that had begun fishing Alaska pollock in eastern Bering Sea in late September was joined by another in early October. It is believed both returned home some time after mid-month.

FORECASTING WORLD DEMAND FOR TUNA TO THE YEAR 1990

Frederick W. Bell

Total world demand for tuna continues to increase rapidly due to rising populations and expanding per-capita income in the principal tuna-consuming countries, such as the U.S., Japan, and members of the European Economic Community (EEC). EEC comprises Belgium, Luxembourg, France, West Germany and the Netherlands.

Taking into account expected increases in population and standard of living (per-capita income) over the next 20 years, we have forecast that world tuna consumption would approach 5 million metric tons by 1990 if supplies were available. However, this is not possible because maximum sustainable yield of known tuna resources in the world is estimated to be no more than 2.6 million metric tons.

To match consumption with available supplies, it is likely that prices of tuna will increase appreciably in the next 20 years. The increasing pressure of demand makes it especially necessary to consider sound management schemes to reduce the possibility of overfishing and destroying the world's tuna resources.

During recent years, the world demand for tuna has increased rapidly. Tuna and tuna-like fish in this article include: albacore, bigeye, bluefin, bonitos, frigate mackerels, little tunas, skipjack, yellowfin, and tuna-like species.

According to the Food and Agriculture Organization of the United Nations, total world consumption of tuna and tuna-like species (in round weight) increased from 804,700 metric tons in 1956 to 1,330,000 metric tons in 1967. The consumption of raw and canned tuna by selected countries during 1955-66 is shown in Table 1.

If the world demand for tuna continues to increase over the next few decades, as expected, there is serious question whether the world's oceans can provide for this rising consumption. So it becomes increasingly important to have adequate knowledge regarding the demand for tuna over the next 20 years. Forecasts of demand can be used to predict when demand will equal or surpass supply. This has practical significance to all agencies involved in fishery policy and programs, to the commercial fishing industry, and to the public.

For fisheries experiencing added pressure on existing stocks, economic forecasts, plus biological forecasts, can provide basis for identifying areas of potential pressure on prices, and indications of other market adjustments that may take place. Such forecasts also underscore the need for improved management policies.

Dr. Bell is Chief, Division of Economic Research, BCF. This project is part of a Division study on forecasting world demand for fishery products.

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Table 1 - Consumption of Raw and Canned Tuna by Selected Countries, 1956-1966 (Raw is fresh and frozen tuna. Canned has been converted to round-weight basis by increasing it 100 percent.)

Country and degree of processing	1956	1958	1960	1962	1964	1966	1966 as % of total
	------- Thousand metric tons, round weight ----------						percent
U.S.A.							
canned	240.6	281.0	336.2	333.8	350.4	382.8	29.0
Japan							
raw	157.9	217.3	190.6	303.3	243.8	353.0	26.7
canned	48.4	46.8	46.0	39.0	31.8	25.8	2.0
Total	(206.3)	(264.1)	(236.6)	(342.3)	(275.6)	(378.8)	(28.7)
EEC							
canned	71.0	85.2	130.0	142.8	153.8	159.0	12.0
Spain							
raw	5.0	14.0	12.2	17.8	21.5	31.8	2.4
canned	29.0	37.0	25.2	28.4	25.8	37.8	2.9
Total	(34.0)	(51.0)	(37.4)	(46.2)	(47.3)	(69.6)	(5.3)
Peru							
raw	33.0	33.9	59.0	58.6	80.0	50.2	3.8
China (Taiwan)							
raw	16.1	18.5	15.8	29.2	25.0	38.0	2.9
canned	0.6	1.4	1.4	3.0	7.2	6.8	0.5
Total	(16.7)	(19.9)	(17.2)	(32.2)	(32.2)	(44.8)	(3.4)
Turkey							
raw	53.7	25.3	31.7	3.8	11.2	16.0	1.2
Canada							
canned	5.3	4.6	6.9	8.2	8.5	10.2	0.8
U.K.							
canned	12.0	5.6	4.2	5.4	7.8	7.6	0.6
Other							
raw	64.0	130.0	149.8	186.4	160.5	89.0	6.7
canned	68.1	54.4	48.1	83.4	84.7	112.0	8.5
Total	(132.1)	(184.4)	(197.9)	(269.8)	(245.2)	(201.0)	(15.3)
Total							
raw	329.7	439.0	459.1	599.1	542.0	578.0	43.8
canned	475.0	516.0	598.0	644.0	670.0	742.0	56.2
Total	804.7	955.0	1057.1	1243.1	1212.0	1320.0	100.0

Source: Original data from 'FAO Yearbooks of Fishery Statistics' compiled by Liaqat Ali, "World Raw and Canned Tuna Situation," 'Commercial Fisheries Review,' Fish and Wildlife Service, Vol. 30, No. 2, Feb. 1968, pages 24-31.

Table 1A - Data Related to U.S. Demand for Canned Tuna

Year	Per capita consumption of canned tuna	Wholesale price: canned tuna	Wholesale price: canned salmon	Per capita disposable personal income	Consumer price index for meat, fish and poultry	Wholesale price index	Consumer price index
	pounds	cents per pound		dollars	1957-59 = 100		
1947	0.78	78.4	44.5	1,179	84.8	81.2	77.8
1948	0.89	81.7	52.0	1,290	96.2	87.9	83.8
1949	0.89	69.3	39.0	1,264	91.1	83.5	83.0
1950	1.13	64.6	52.9	1,364	95.1	86.8	83.8
1951	1.22	63.1	48.7	1,468	106.1	96.7	90.5
1952	1.27	63.4	45.9	1,518	105.3	94.0	92.5
1953	1.37	67.2	43.8	1,582	99.6	92.7	93.2
1954	1.37	66.4	46.2	1,585	97.6	92.9	93.6
1955	1.43	63.7	51.6	1,666	92.1	93.2	93.3
1956	1.57	61.2	56.5	1,743	88.0	96.2	94.7
1957	1.58	58.4	55.9	1,803	95.4	99.0	98.0
1958	1.77	58.4	51.8	1,831	104.4	100.4	100.7
1959	1.88	56.4	60.7	1,905	100.4	100.6	101.5
1960	2.05	57.3	64.9	1,937	99.1	100.7	103.1
1961	2.08	60.9	66.0	1,983	99.3	100.3	104.2
1962	1.97	62.5	58.5	2,064	101.7	100.6	105.4
1963	1.98	61.7	55.6	2,136	100.2	100.3	106.7
1964	2.01	62.2	53.1	2,280	98.6	100.5	108.1
1965	2.32	65.0	70.4	2,432	105.1	102.5	109.9
1966	2.20	68.5	64.6	2,598	114.1	105.9	113.1
1967	2.32	67.3	73.6	2,744	111.2	106.1	116.3

Source: U. S. Department of the Interior, U. S. Department of Commerce, and U. S. Department of Labor.

FACTORS BEHIND DEMAND FOR CANNED TUNA: U.S. EXPERIENCE

Expressed in round weight, U.S. per-capita consumption of canned tuna increased from 1.56 pounds in 1947 to 4.64 pounds in 1967. What are the factors behind this rapid increase? A statistical analysis was made in which the following factors were related to per-capita consumption of canned tuna:

1. Wholesale price of canned tuna relative to general price level in U.S. economy.

2. Per capita disposable personal income relative to general price level in U.S. economy (standard of living).

3. Wholesale price of canned salmon relative to general price level.

4. Retail price of meat, poultry, and fish as category relative to general price level.

The hypothesis concerning these relationships was: If canned tuna prices go up, per-capita consumption would fall because consumers would substitute other foods or goods for tuna; if per-capita income increases, per-capita consumption of canned tuna would rise because consumers would have a higher standard of living and could enjoy more tuna; if the price of canned salmon were to increase relative to tuna, this would increase canned-tuna consumption as consumers switched from salmon to tuna; and, finally, if the price of meat, poultry, and fish as a category went up relative to tuna, consumers would eat more canned tuna. What did we find?

For the U.S. during 1947-67, per-capita consumption of canned tuna was influenced primarily by the price of canned tuna and per-capita income. The price of canned salmon and the price of meat, poultry, and fish as a category were not statistically important. Figure 1 shows the estimating accuracy of our statistical equation. This related U.S. per-capita consumption of canned tuna to canned tuna prices, per-capita income, canned salmon prices, and the price of meat, poultry, and fish as a category. The estimating accuracy of our equation is very good over the 1947-1967 period.

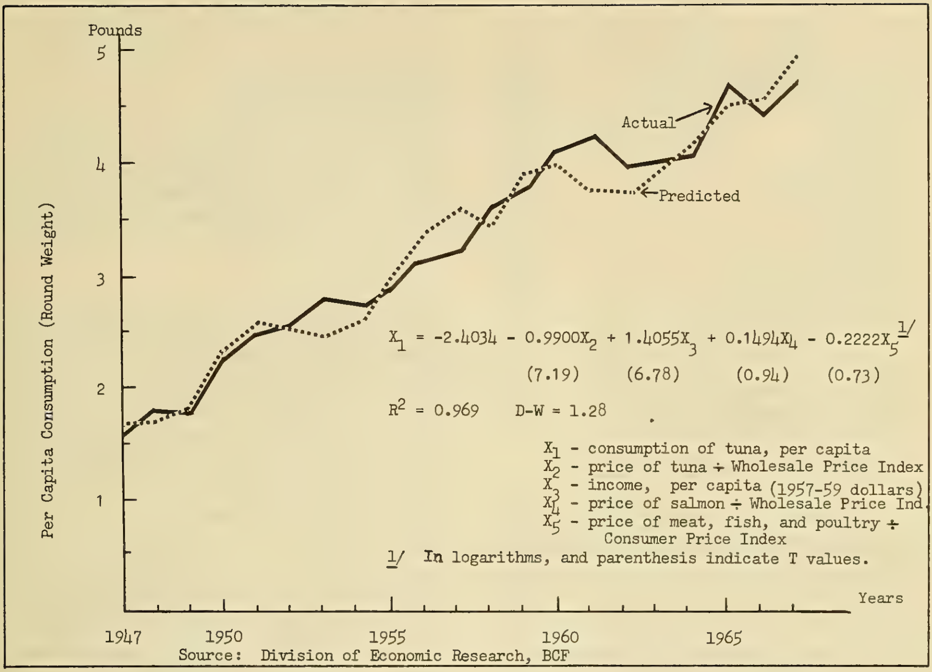

Fig. 1 - Comparison of actual and estimated per-capita consumption of canned tuna, United States, 1947-67.

According to the analysis, a 10% increase in tuna prices would reduce tuna per-capita consumption by approximately 10%. However, a 10% increase in per-capita income would increase per-capita consumption of canned tuna by about 14%. These quantitative relationships allow prediction of the impact of, for example, a 50% increase in per-capita income, or a 20% rise in price of canned tuna on per-capita consumption. These are very important relationships that must be known before reliable forecasts can be made.

DEMAND FACTORS FOR RAW AND CANNED TUNA ABROAD

Analyses of demand factors similar to those carried out for the U.S. were applied to Japan, EEC countries, Spain, Peru, China (Taiwan), Turkey, Canada and the United Kingdom. These and the U.S. account for about 85% of world consumption of tuna. The demand for tuna was divided into raw and canned in some countries where both forms are a significant percentage of consumption. Because of the lack of statistical importance of salmon prices, and meat, fish, and poultry prices found in the U.S. analyses--and the difficulty of obtaining data for other countries--these factors were omitted from the statistical analyses.

For the countries studied, the results indicated that per-capita income and tuna prices were significant factors in explaining changes in per-capita consumption of tuna over the last 11 years. Table 2 shows the percentage response of tuna per-capita consumption in the various tuna-consuming countries to a 1% increase in per-capita income. Of special interest, such culturally similar countries as Canada, the U.S., and EEC members have nearly the same response of per-capita consumption of canned tuna to changes in per-capita income. Only a few countries showed a decline in per-capita tuna consumption with

Table 2 - The Percentage Increase in Per-Capita Consumption of Tuna Due to A 1% Increase in Per-Capita Income for Selected Countries, 1956-66

Country and Degree of Processing	Percent
China (Taiwan) - canned	4.76
Spain - raw	1.85
Peru - raw	1.76
EEC - canned	1.47
Canada - canned	1.45
U.S.A. - canned*	1.41
China (Taiwan) - raw	.85
Japan - raw	.57
Spain - canned	.38
U.K. - canned	0
Japan - canned	0
Turkey - raw	0

*For U.S., the relationship between per-capita consumption and income was estimated using data for 1947-67.
Source: BCF Division of Economic Research.

increases in per-capita income. Hence, increases in the standard of living will probably have a very pronounced effect on the demand for tuna in the coming decades.

A FORECAST OF TUNA DEMAND

To forecast world market for tuna over the next 20 years, we must first predict the expected increase in per-capita consumption of tuna. Our first forecast is provisional in the sense that we ask ourselves the following question: What would be the per-capita consumption of tuna by the year 1990 if we allowed for expected increases in per-capita income--and assumed no change in tuna prices relative to general price level? Using our statistical relationships developed above--with U.S. Department of Agriculture projections to 1990 of per-capita income for principal tuna-consuming countries--we made a forecast of per-capita consumption of tuna. Then, this was multiplied by the population expected to exist by 1990 to obtain the forecasted tuna market.* These provisional forecasts are shown by country in Table 3.

Based on expected increases in population and standard of living (per-capita income), world consumption is expected to reach about 2.8 million metric tons by 1980, and 5 million metric tons by 1990. This is shown in Figure 2 as projection A. In other words, world tuna consumption is expected to double in each of the next two decades--assuming world supplies are adequate and there is no rise in tuna prices. Further, the analysis showed that of the expected increase in tuna demand over the next 20 years, only about 10% would be attributable to population increases--the balance to increases in standard of living.

CAN OCEANS SATISFY RAPIDLY RISING DEMAND FOR TUNA?

Based upon recent analyses, biologists estimate that world tuna production, potentially, may be increased up to 1.25 million metric tons above today's 1.3 million metric tons. (A BCF Tuna Study group recently reviewed literature and concluded this was best available estimate.)

Most of this increase must come through harvesting skipjack in the Pacific, Indian, and Atlantic oceans. Adding potential increase to 1966 production, we must conclude that nature will provide about 2.6 million metric tons of tuna on an annual sustainable basis. Without any price changes, we have shown that demand will be over 2.8 million metric tons by 1980; by 1990, the forecasted demand will considerably exceed maximum sustainable yield from the world's oceans. What are the implications?

The pressure of this expanding demand relative to a rather fixed supply will put increasing pressure on tuna prices. Also, the cost of harvesting tunas will increase rapidly for two extremely important reasons: 1) Additional supplies must be derived principally from skipjack resources of Central Pacific; under known technology, these are extremely difficult to find and harvest. 2) Increased fishing effort on tuna resources in general probably will reduce catch per unit of effort. This would increase cost per pound of fish landed.

It is quite probable that prices and cost of tuna will double by 1990. For an increase in tuna prices to reduce consumption, it is necessary that these increase more rapidly than general price level. More precisely, we are forecasting that prices of tuna relative to general price level will double by 1990.

The higher price of tuna will reduce consumption. At the higher prices, it is forecasted that world production and consumption of tuna will be equal at about 2.1 million metric tons by 1990. This is shown in Figure 2 in projection B. If we forecast tuna demand to the year 2000, the results indicate tuna prices will probably triple--and that production

*The sum of individual forecasts for each of the 9 country categories was increased by the average percent for rest of world's tuna consumption during 1956-1966. Population forecasts were obtained from U.S. Department of Agriculture.

Table 3 - Forecasts of Total World Tuna Consumption Based on Increases in Population and Per-Capita Income for Selected Countries, 1970, 1975, 1980, 1985, and 1990 (Prices held constant at 1966 value, if unlimited supplies were available.)

Country and degree of processing	1966 Actual	1970	1975	1980	1985	1990
	-------- Thousand metric tons, round weight ---------					
U.S.A.						
canned	382.8	511.3	671.6	845.3	1055.8	1318.4
Japan						
raw	353.0	382.2	486.9	620.6	790.1	1005.6
canned	25.8	26.4	27.6	28.9	30.2	31.6
total	(378.8)	(408.6)	(514.5)	(649.5)	(820.3)	(1037.2)
EEC						
canned	159.0	210.5	281.4	382.8	522.5	713.4
Spain						
raw	31.8	30.3	50.5	73.1	105.8	153.2
canned	37.8	19.1	21.9	24.4	27.3	30.5
total	(69.6)	(49.4)	(72.4)	(97.5)	(133.1)	(183.7)
Peru						
raw	50.2	98.7	137.3	194.7	275.1	387.4
China (Taiwan)						
raw	38.0	35.1	44.1	56.0	71.0	90.3
canned	6.8	12.8	27.7	63.7	146.0	334.7
total	(44.8)	(47.9)	(71.8)	(119.7)	(217.0)	(425.0)
Turkey						
raw	16.0	17.9	20.6	23.5	26.9	30.7
Canada						
canned	9.7	11.6	15.2	19.5	25.0	32.1
U.K.						
canned	7.6	7.4	7.8	8.0	8.3	8.6
Total - selected countries	1118.5	1363.3	1792.6	2340.5	3084.0	4136.5
Grand total (Projected at 120% of total for selected countries.)	1320.0	1636.0	2151.1	2808.6	3700.8	4963.8

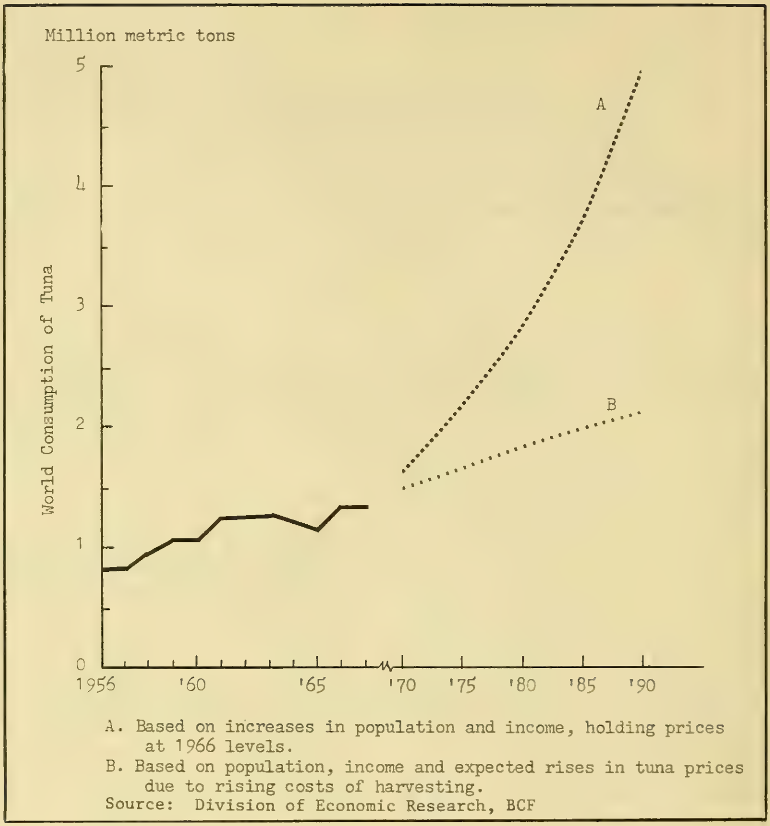

Fig. 2 - Forecasted increases in world demand for tuna.

and consumption will equal maximum sustainable yield for world's tuna resources. This implicitly assumes that as each tuna stock reaches maximum sustainable yield, a regulatory authority is able to prevent overfishing.

A NEED FOR POLICY

We must point out some critical facts. First, tuna demand is extremely strong and is likely to expand greatly over the next 20-30 years. Second, without any increases in tuna prices, consumption would likely exceed the oceans' potential production by a ratio of two to one by 1990--and, possibly, by five to one by 2000. These events will put great upward pressure on tuna prices. Such price increases would relieve demand pressure on fixed and relatively scarce tuna resources by discouraging further consumption increases. Most probably, the mushrooming demand will turn tuna into a luxury good.

The need for policy is unmistakable. With increasing pressure on tuna resources, the possibility of overfishing looms--unless there are significant breakthroughs in other areas, such as tuna aquaculture. A vigorous program of world management must be instituted to avert resource destruction.

Already, the Inter-American Tropical Tuna Commission and the Atlantic Tuna Commission are engaged in this effort. But the astounding pressure of world demand adds urgency to the need for more effective global management than the present scheme permits.

Our forecasts are tentative. We may have to adjust or refine these further when more information on tuna consumption becomes available. For example, the response of tuna consumption to income may diminish over time and dampen, somewhat, the projections. However, at the present time, these estimates are the best available--and certainly useful in identifying areas of concern and in underlining the need for action.

HOW ARE OCEANOGRAPHIC OBSERVATIONS TAKEN BESIDE FROM A SHIP?

Because oceanographic ships are expensive to operate, difficult to anchor in deep water, and limited in speed, continuous observations in one location and surface observations over wide ocean areas can best be accomplished by means other than ships.

Buoys have been used for many years to obtain measurements of surface and subsurface currents and temperatures, as well as to observe meteorological conditions. These observations were mostly made near shore because of the difficulties in deep-sea anchoring and long-distance radio transmission. More recently other measurements have been included, such as of salinity and waves.

There is increasing interest in setting up networks of moored buoys which would transmit oceanographic and meteorological information by radio or satellite relay. The NOMAD (Navy Oceanographic Meteorological Automatic Device) buoys have withstood hurricanes and therefore supplied timely and useful data which could not have been collected by ships.

FLIP (Floating Instrument Package) is a hybrid ship-buoy. It is towed in the horizontal position to its location, where ballast tanks at one end are flooded, thus flipping it to the vertical position. FLIP serves as a stable, manned platform or "buoy" with observation ports extending to a depth of about 300 feet.

Offshore towers have also been used for collection of oceanographic data. Some, such as the Navy Electronics Laboratory tower located a mile off the San Diego, California, coast, have been built specifically for oceanographic research; others, such as the Air Force radar towers (Texas towers), were built for other purposes but also used as observation sites by oceanographers. The Coast Guard is undertaking a significant and extensive oceanographic data collection program on its new offshore towers. These towers, which replace the lightships as outer channel markers to major East Coast and West Coast ports, are being equipped with an impressive array of oceanographic instruments.

Surface data, primarily temperature, have been collected by extremely sensitive sensors on aircraft and satellites. Frequent flights have made it possible to map the meanderings of the Gulf Stream.

Subsurface observations have been made by submersibles and by divers operating either from the surface or from underwater laboratories. ("Questions About The Oceans," U.S. Naval Oceanographic Office.)

REARING LARVAL TUNAS IN THE LABORATORY

Edward D. Houde and William J. Richards

Despite the extensive high-seas fisheries for the several species of tunas, little is known about the early life of these fishes. One of the objectives of the Life History Studies Program at BCF's Tropical Atlantic Biological Laboratory (TABL) is to solve problems that biologists encounter in working with eggs and larvae of tunas. We hope to rear successfully tuna larvae from fertilized eggs--and to describe the egg and the development of the species from hatching to the juvenile stage. At present, tuna larvae caught at sea are difficult to identify with certainty because of the similarity in appearance among tuna species. We hope also to determine growth rates and mortality rates of tuna larvae reared in the laboratory and to investigate factors that may have an important influence on survival. If the effects on larval survival of physical and biological factors can be evaluated, then useful predictions of future recruitment to tuna stocks in the open sea may be possible--through the use of indices of larval abundance, and measurements of such environmental variables as temperature, salinity, and availability of potential food for tuna larvae.

Obtaining Eggs and Embryos

Tunas are seldom caught when they are ready to spawn. Attempts made by TABL biologists to artificially fertilize tuna eggs on research cruises have been unsuccessful. Kume (1962) has reported the only known successful fertilization of tuna eggs. Two larvae of the bigeye tuna, Thunnus obesus, hatched in his experiments--but survived less than one day. Because we could not obtain adult spawners at TABL, we collected planktonic fish eggs in the Straits of Florida hoping that some tuna eggs might be present and that they might then be hatched in the laboratory.

Eggs were collected from May through August 1969 in the western edge of the Gulf Stream near Miami, Florida (Fig. 1). A 1-m. plankton net was towed at the surface where the pelagic eggs of many species of fish drift until they hatch. Collections were brought to the laboratory and an attempt was made to sort the eggs by type. Then eggs were incubated and the larvae were reared. Examination of larvae that hatched from eggs collected in May 1969 showed that we had successfully hatched, and reared to 12 days past hatching, larvae that we identified later as those of the little tuna, Euthynnus alletteratus (Fig. 2). This was the first time tuna were reared past the yolk sac stage under laboratory conditions.

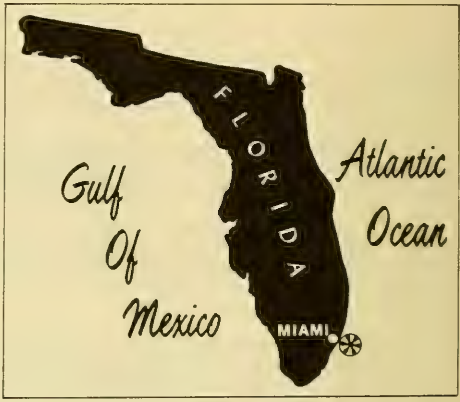

Fig. 1 - Area where eggs of the little tuna were collected. The eggs were hatched and reared in the TABL laboratory at Miami.

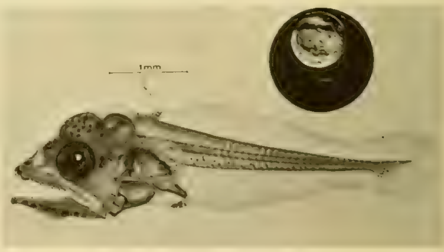

Fig. 2 - Twelve-day-old larva of the little tuna reared in laboratory.

The authors are biologists with BCF Tropical Atlantic Biological Laboratory, Miami, Florida 33149.
Note: See also "Larval Tuna Fish Reared for First Time," COMMERCIAL FISHERIES REVIEW 31(6):7(June 1969).

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Rearing Methods

Success in rearing tuna larvae beyond the yolk sac stage was achieved by using two slightly different methods. In the first, eggs were incubated in 20-gal. aquaria to which a dense culture of Chlorella was added to induce a "bloom" in the tank. We had known from previous experience that the likelihood of success in rearing pelagic fish larvae in small tanks increased by the Chlorella, but its role in promoting success is still unclear. In the second method, to vary the experiment, incubation and rearing were attempted in a 140-gal., round, fiberglass tank to which no Chlorella was added. Both tanks were aerated and circulated by compressed air provided through airstones. Water temperature was held at approximately 26° C. Lights were left on continuously in all tuna-rearing experiments.

Tuna larvae hatched within 12 hrs. of collection, probably within 24 hrs. after the eggs were spawned in the Gulf Stream. The larvae were slightly less than 3 mm. long at hatching and had a large yolk sac with a single, prominent oil globule. The eyes were unpigmented and no functional mouth or gut was present. Within 48 hrs. after hatching, the yolk was absorbed, larvae had developed pigmented eyes, and mouth and gut were functional. Food was added to the tanks at this time.

The food on which larvae of the little tuna began to feed was zooplankton collected in Biscayne Bay by a 35-micron mesh plankton net. For the first 3 days, only plankton less than 100 microns in body width was fed to the larvae, but larger organisms were offered to older larvae. Most of the food provided consisted of copepod nauplii and copepodites. Larvae in the 20-gal. aquaria and the 140-gal. tank accepted this food. Tuna larvae were very active in their search for food, and feeding rates were higher than those of many other fish larvae that we have reared.

The growth of larvae in our experiments probably was not as fast as in the natural environment. Though larvae fed well for about the first 10 days after hatching, the condition of most larvae then deteriorated. The growth in length for one rearing experiment is shown in Figure 3. Slow growth may have been due to a gradual increase in metabolites or bacterial contamination in the rearing tanks. We suspect that the behavior of larvae also may have been altered under tank conditions because most older larvae would not accept as food the larger zooplankton which has been observed in the guts of ocean-collected larvae. Twelve days after hatching, some larvae did accept brine shrimp (Artemia salina) nauplii, but the larvae would not eat large zooplankton or other larval fish.[1/]

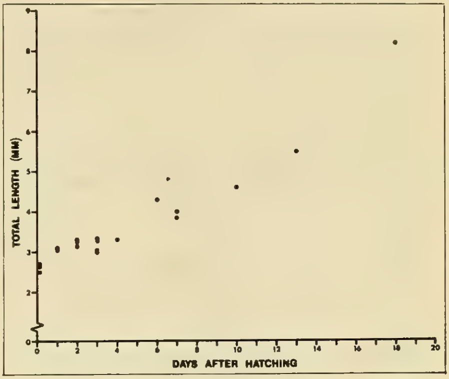


Fig. 3 - Growth in length of little tuna larvae reared in laboratory.

Larvae of the little tuna have not survived beyond 18 days after hatching in any of our experiments from May through July 1969. Causes for the complete mortalities are still unknown. About half our attempts failed because larvae did not initiate feeding and died shortly after absorption of the yolk. The percentage of successes was higher in the 140-gal. tank than in 20-gal. tanks; this suggests that the larger volume of water was beneficial to rearing. No rearing attempts were successful in 20-gal. tanks without a bloom of Chlorella, although larvae fed readily in the 140-gal. tank without Chlorella. One source of mortality undoubtedly was the presence of food at a density other than the optimum. Too little food could have caused starvation of the larvae, but too great an amount could have polluted the rearing tanks in a few days. The effects of food density and feeding rates on survival of tuna larvae are critical problems yet to be solved.

1/Charles Mayo, School of Marine and Atmospheric Sciences, University of Miami, recently succeeded in rearing the little tuna to more than 20 mm. long, and larvae of bullet mackerel (Auxis sp.) to about 12 mm. His larvae accepted larger food and growth was faster than in our experiments.

Potential for Rearing

Tunas probably can be reared beyond the larval stage in sufficient quantity for experimental purposes. Techniques still need to be improved. But the major obstacle in culturing pelagic larvae of marine fishes--failure of larvae to initiate feeding--does not seem as great a problem for tuna larvae (at least for the little tuna) as it is for larvae of many other fishes that we have attempted to rear. Experimental rearing of tunas offers an exciting opportunity to study many critical problems associated with life during the larval stage. Studies of growth, nutritional requirements, behavior, and survival can be carried out in the laboratory under a variety of conditions.

The potential for culturing tunas commercially remains unclear. One problem is the lack of a reliable and continuous source of tuna eggs. Collecting fertilized eggs in a plankton net is an undependable method of obtaining large numbers. Catches at sea of adult tunas ready to spawn are rare. This precludes the possibility of artificially fertilizing their eggs. Recent successes in maintaining adult tunas in captivity (Nakamura, 1962; Inoue et al, 1967) suggest that hormone injections might be used to stimulate these captive fish to spawn. Because adult tunas are among the most difficult of fishes to handle without causing mortality, however, the repeated handling now necessary when using hormone injections may be impossible for successful spawning of tunas and tunalike fishes.

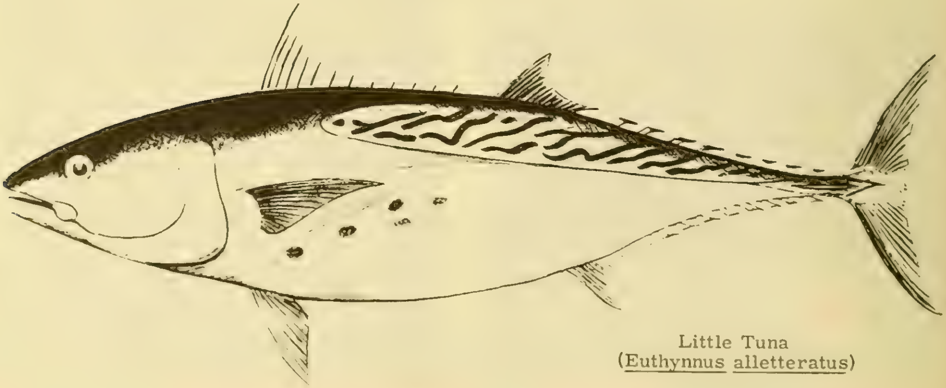
Other problems to be solved include providing large quantities of animal food, and the large volume of good water required by fast-growing and active tunas. Some of our laboratory-rearing experiments may help to determine whether these problems can be overcome and, if so, whether tunas can be reared on a commercial scale.

LITERATURE CITED

INOUE, M., R. AMONA, Y. IWASAKI, and M. AOKI
1967. Ecology of various tunas under captivity - 1. Preliminary rearing experiments. J. Fac. Oceanogr., Tokai Univ. 2: 197-209.

KUME, S.
1962. A note on the artificial fertilization of bigeye tuna, Parathunnus mebachi (Kishinouye). Rep. Nankai Reg. Fish. Res. Lab. 15: 79-84.

NAKAMURA, EUGENE L.
1962. Observations on the behavior of skipjack tuna, Euthynnus pelamis, in captivity. Copeia 1962(3): 499-505.



Little Tuna
(Euthynnus alletteratus)

FISHERY OCEANOGRAPHY--V
OCEAN CIRCULATION AND DISTRIBUTION OF SOCKEYE SALMON

Felix Favorite

Early in this century, sealers frequently encountered a change in water color and an increase in sea birds and fur seals south of Attu Island, Alaska (near lat. 50° N., between long. 173° E. and 180°). The sealers believed these conditions were caused by a shallow bank. It was not until 1936 that forerunners of modern acoustic sounding devices showed that the ocean depths throughout this area not only exceed 3,500 meters but, in some places, 7,000. More than two decades later, the phenomenon was attributed to a westward intrusion of coastal water from the Gulf of Alaska.

This is not an unusual example of the time scale required to pursue maritime investigations. It is indicative of the challenging but frustrating aspects of fishery oceanography: lack of adequate funds, facilities, and equipment requires the gradual piecing together of fragmentary bits of data over long periods. Significant advances are delayed unduly when the investigators--discouraged by long intervals between major breakthroughs--abandon this field and carry away extensive background knowledge and untested theories. They leave behind them incomplete models.

Unusually Low Salinity Water

In 1935, and again in 1938, data from a few oceanographic stations indicated the presence of water of unusually low salinity south of Unimak Island (west end of the Alaska Peninsula). It was then believed that this water was carried into the area by a stream or eddy from the Gulf of Alaska. But extensive observations south of the Aleutian Islands since 1955 have enabled us to show that this low salinity water extends westward beyond the westernmost Aleutian Island--and has branches that shoot southward and eastward from this flow (thereby completing circulation in the Gulf of Alaska). Two specific examples of the flow, as indicated by the surface salinity in 1956 and 1958, and a schematic diagram for the years in which adequate data are available, are shown in figure 1. Although the westward flowing dilute water moves northward through eastern passes in the Aleutian Island chain, high salinity water (33 ‰) intrudes southward from the Bering Sea in the central part of the chain and forces the dilute water offshore. The flow assumes a jet-like character, with westward velocities in excess of 50 cm./sec. (about 1 knot) and sometimes as great as about 100 cm./sec.

In summer 1959, we were able to define this current system, which also advects warm water into the western North Pacific Ocean; we assigned it the name "Alaskan Stream." Evidence was obtained that the Stream terminated near long. 170° E., where the main flow was northward into the Bering Sea. Not until 1962 were we able to obtain winter observations and show that this flow was not limited to the spring and summer--but was a year-round feature. In 1966, we were able to show that the westward flow also ended near long. 170° E. in winter.

Sharp Surface Fronts Detected

During the spring of 1969, while using continuously recording surface temperature and salinity devices at long. 175° W., we encountered sharp surface fronts at the northern and southern boundaries of this flow. In some instances, the change in water color was very noticeable, although no unusual activities of sea birds or seals were reported. One would expect the changes in ocean conditions to be more striking farther westward, however, between long. 170° E. and 180° near lat. 50° N.; there, the Alaskan Stream meets with the northward branch of the Subarctic Current at the eastern boundary of the Western Subarctic Gyre (fig. 2).

An Asian source of dilute coastal water, shown to intrude seaward off the Kuril Islands

Dr. Favorite is an Oceanographer with BCF's Biological Laboratory, 2725 Montlake Blvd. East, Seattle, Wash. 98102.

U.S. DEPARTMENT OF THE INTERIOR
Fish and Wildlife Service
Sep. No. 858

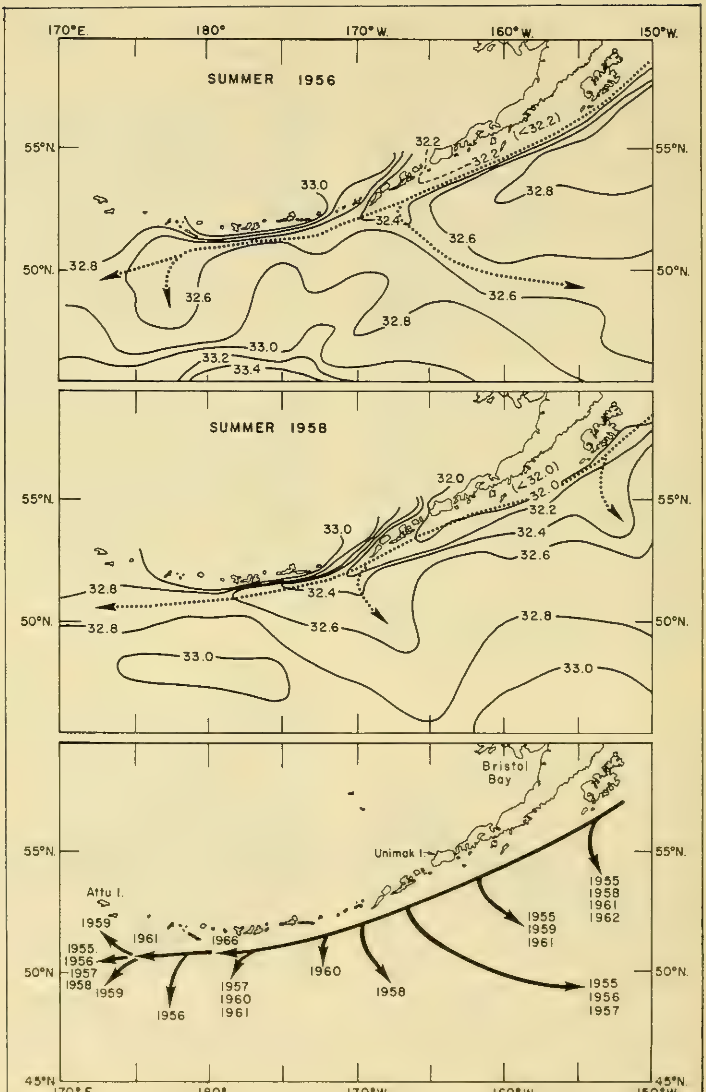


Fig. 1 - Surface flow along the south side of the Aleutian Islands (as indicated by surface salinity, in parts per thousand) showing continuity of the westward flow in summer 1956 and 1958; lower panel, variability in location at which southern branches diverge from main flow.

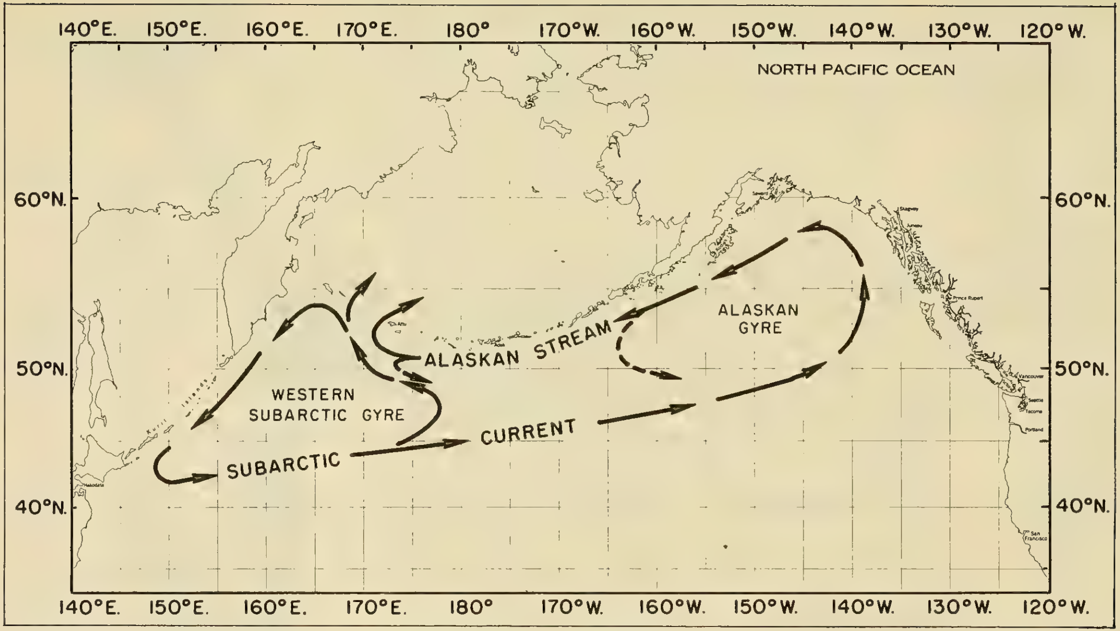


Fig. 2 - Schematic diagram of circulation in Subarctic Pacific Region south of the Aleutian Islands, showing Alaskan and Western Subarctic Gyres--and location (long. 170° E.) where westward-flowing Alaskan Stream meets northern branch of Subarctic Current.

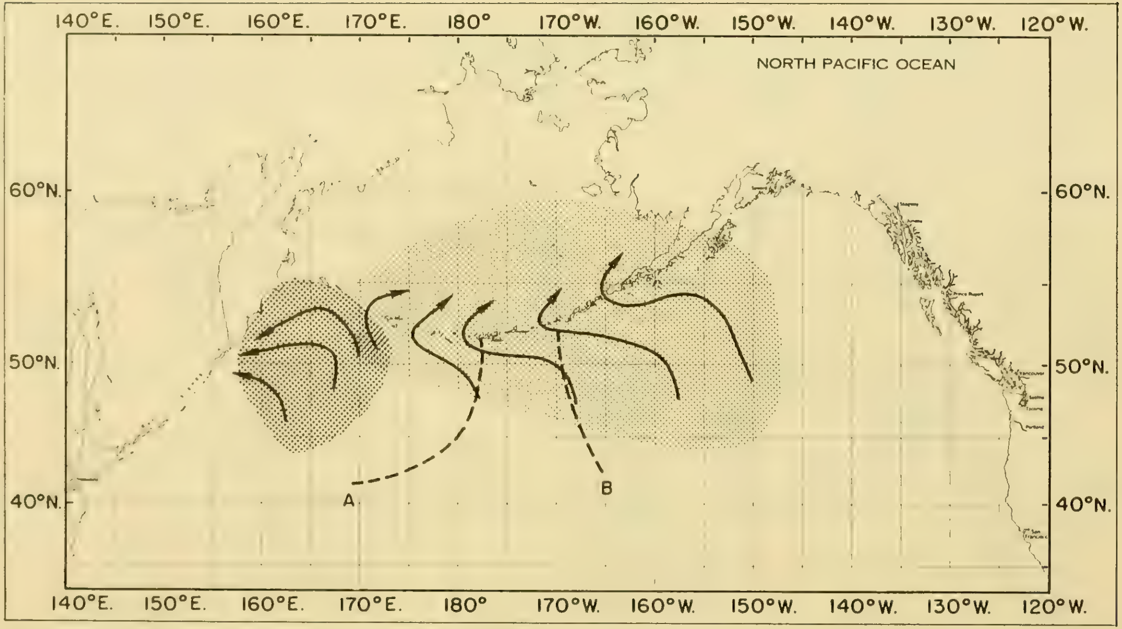


Fig. 3 - Migration routes of sockeye salmon of Asian and Bristol Bay origin during spring, the eastern limit (A) of distribution of sockeye salmon of Asian origin, and the western limit (B) of sockeye salmon of Gulf of Alaska origin (after Kondo et al., 1965).

('Fishery Oceanography IV', CFR, Nov. 1969), enters the ocean in southwestern part of Western Subarctic Gyre. Part of this water, whose properties in the surface layer are strikingly different from those in the Alaskan Stream, is advected cyclonically around the gyre and encounters water from the Stream south of the western Aleutian Islands. The rest continues eastward and mixes with water to the north and south, gradually losing its identifying characteristics.

Sockeye Salmon & Their Environment

During our early investigations, changes in salmon catch occurred as the vessels proceeded southward from the western Aleutian Islands through the Alaskan Stream and into Western Subarctic water. But our investigations west of long. 175° E. have been limited. Three particularly interesting relations between sockeye salmon and their ocean environment have been indicated from tagging experiments[1] (fig. 3): First, the distribution of sockeye salmon of Asian origin appears to be associated with the general extent of Western Subarctic Gyre and the distribution of those of Gulf of Alaska origin with Alaskan Gyre. Second, sockeye salmon of Bristol Bay origin move westward in the Alaskan Stream before turning eastward to Bristol Bay; thus they appear to be influenced by this current. Third, there is only a small area of presumed intermingling of Asian and Bristol Bay fish near long. 170° E., the area where water from Alaskan Stream and northern branch of Subarctic Current meet. The foregoing suggests not only that these stocks inhabit different environments during their ocean residence, but also that oceanic conditions have a significant effect upon salmon--as well as upon birds and mammals, as reported in the days of sailing ships.

Origin of Salmon

Japanese fishermen say that while fishing south of the western Aleutian Islands they can identify sockeye salmon of Bristol Bay origin by their subtle green coloring, in contrast to the gray-black of sockeye salmon from Asia. If true, might this be a racial characteristic, or is it caused by differences in ocean environments? Scientific determinations of the origin of salmon are based upon tagging experiments and studies of the scales, parasites, and physiological-biochemical characteristics of the various stocks.

Of course, all this evidence is offered as conjecture, or pieces of a puzzle, and not as proof. Models of migration paths are emerging--some related to oceanographic features, some not; some contested, some not completely tested. Nevertheless, even though numbers of salmon caught may show what is happening, one must turn to fishery oceanography to ascertain why. Many people believe that the availability of food organisms influences movements of salmon. Some aspects of this subject will be presented in the next article.

1/Kondo, Heihachi, Yoshimi Hirano, Nobuyuki Nakayama, and Makoto Miyake. 1965. Offshore distribution and migration of Pacific salmon (genus Oncorhynchus) based on tagging studies (1958-1961). Int. N. Pac. Fish Comm. Bull. 17, 213 pp.

Sockeye (red) Salmon
(Oncorhyncus nerka)

CATFISH FARMING

"Construction of Commercial Catfish Ponds," prepared by T. D. Prestridge Jr. and Edward R. Smith, Department of Agriculture, Soil Conservation Service, Alexandria, La., January 1969, illus.

This is a one-page leaflet outlining some important construction features required for catfish production--pond types, water areas, depth, control, and supply.

DOLPHINS

"Dolphin Noises Recorded by Echo-Sounder," by L. J. Paul, Fisheries Research Publication No. 129, Marine Department, Wellington, New Zealand. (Reprint from 'N. Z. Jl. Mar. Freshwat. Research,' Vol. 3, No. 2, June 1969, pp. 343-8, illus.)

Some records of ultrasonic signals from dolphins seem to suggest these emissions are used for echo-ranging. Mr. Paul explains the possible uses of such records in studying dolphin behavior.

MARINE MAMMALS

"The Biology of Marine Mammals," edited by Harald T. Andersen, Academic Press, Inc., 111 5th Ave., New York, N.Y. 10003, 1969, 511 pp., indexed, illus.

Contributions from experts in different areas of marine mammal research emphasize the functional biology of mammals adapted to a marine habitat.

OCEANOGRAPHY

"Frontiers of the Sea," by Robert C. Cowne (revised edition), Doubleday & Co., New York, 1969, 318 pp., illus., $6.95.

Updated to include the progress of the 10 years since it was first published, this is a book about the oceans and the science of oceanography, past, present, and future.

PACIFIC SALMON

"Round Trip With the Salmon," by Anthony Netboy, article, 'Natural History,' American Museum of Natural History, Vol. 77, No. 6, June-July 1969, pp. 44-50, 66-67, illus.

Mr. Netboy narrates the migratory drama of the millions of salmon spawned in the rivers of North America and Siberia, their life in the salt water pastures of the North Pacific, and their return to natal waters to mate and die. Charts of their ocean migration patterns are included.

PESTICIDES

"DDT in Trout and Its Possible Effect on Reproductive Potential," by C. L. Hopkins, S.R.B. Solly and A. R. Ritchie, Fisheries Research Publication No. 130, Marine Department, Wellington, New Zealand. (Reprint from 'N. Z. Jl. Mar. Freshwat. Research, Vol. 3, No. 2, June 1969, pp. 220-9.)

Eggs of rainbow trout (Salmo gairdneri Richardson) were reared to discover whether they showed significant survival differences that could be linked with DDT levels in the tissue. The eggs were taken from trout in 5 different lakes: three drain land often treated with DDT, and 2 are virtually free of agricultural contamination. The authors found a possible link between the presence of DDT and the failure of the egg to develop normally.

POLLUTION

"In the Wake of the Torrey Canyon," by Richard Petrow, David McKay Co., Inc., New York, 1968, 256 pp., illus.

Mr. Petrow reports on all aspects of the Torrey Canyon disaster--the personal stories of those it affected, the blunders and successes in repairing the damage, and the unfinished, and still unsolved, legal and biological aftermaths.

"Marine Pollution: can we control it to advantage?" by Maurice Fontaine, article, 'Ceres,' FAO Review, Vol. 2, No. 3, May-June 1969, UNIPUB, P.O. Box 433, New York, N.Y., pp. 32-5, illus. (Single issue $0.50.)

Mr. Fontaine believes a good use should be found for pollution agents after they have been controlled. He suggests several methods of study.

SALT WATER AQUARIA

"The Marine Aquarium," by Robert F. O'Connell, Great Outdoors Publishing Co., 4747 28th St., North, St. Petersburg, Fla., 33714, 158 pp., illus., $6.95.

This is a comprehensive description of how to set up an ideal marine tank, and to create the conditions in which marine fish will thrive. It includes the latest techniques and equipment for filtration, heating, lighting, decoration, and feeding. Superb color photographs of many species are included.

FISH & WILDLIFE SERVICE PUBLICATIONS

The following reports, published by the Department of the Interior, Fish & Wildlife Service, BCF, are available from Publications Unit, BCF, 1801 N. Moore St., Arlington, Va. 22209:

Alaskan Freshwater Fishes

"Distribution of Fishes in Fresh Water of Katmai National Monument, Alaska, and Their Zoogeographical Implication," by W.R. Heard, R. L. Wallace, and W. L. Hartman, SSR-F 590, October 1969, 20 pp., illus.

This is a report on investigations of the distribution and occurrences of freshwater fishes in an area divided by the Aleutian Mountain Range. The authors describe their methods and equipment, discuss the zoogeographical implications, and include an annotated list of species.

Gulf of Mexico Fisheries Research

Florida

"Report of the Bureau of Commercial Fisheries Biological Laboratory, St. Petersburg Beach, Florida, Fiscal Year 1968," Circular 313, May 1969, 25 pp., illus.

The report describes the laboratory's research on projects in the estuarine, red-tide, and industrial schoolfish programs. The projects include studies of sediments and organisms in bay bottoms; plankton crops; fishes in and transferring between estuaries and the Gulf of Mexico; and experimental rearing of pompano in an impounded lagoon.

Texas

"Report of the BCF Biological Laboratory, Galveston, Texas, Fiscal Year 1968," Circular 325, October 1969, 32 pp., illus.

This report describes the progress of research on shrimp involving biology, population dynamics, ecology, and oceanography. It includes a summary of methods used to evaluate engineering projects that affect estuary-dependent species on the Texas coast.

Mississippi

"Report of the BCF Technological Laboratory, Pascagoula, Mississippi, Fiscal Years 1967 and 1968," Circular 327, 18 pp., illus.

This report presents the results of research on new and improved methods of preventing development of browning in snapper; rancid odors and flavors in Spanish mackerel; adverse texture changes in frozen oysters; blue discoloration in crab meat; green discolorations in frozen raw breaded shrimp; and adverse changes in canned shrimp during storage.

It describes a countrywide study of shipment of iced fish in leakproof containers and discusses new attempts to increase the iced storage life of shrimp through use of bacteriostatic agents. The report includes developments in sanitary handling of fish meal and results of a study to mechanize the handling of various types of industrial fish.

RADIOECOLOGY

"Research Facilities of the Radiobiological Laboratory, BCF, Beaufort, North Carolina," Circular 298, December 1968, 17 pp., illus., and "Progress Report of the BCF Radiobiological Laboratory, Beaufort, N.C., Fiscal Year 1968," Circular 309, April 1969, 59 pp., illus.

Radioecology is the study of radioactivity in the environment and the use of radioactive elements in ecological studies. The Beaufort Radiobiological Laboratory is supported jointly by BCF and the U.S. Atomic Energy Commission. Its research is concerned with 1) the fate of radioactive materials in the estuarine environment, 2) the effect of radiation on marine organisms, and 3) the application of radioactive tracer techniques to fishery biology.

Circular 298 describes the history, facilities, and organization of the lab. Circular 309 describes some of its studies in estuarine ecology, biogeochemistry, pollution, and radiation effects.

SALMON

"Return and Behavior of Adults of the First Filial Generation of Transplanted Pink Salmon, and Survival of Their Progeny, Sashin Creek, Baranof Island, Alaska," by Robert J. Ellis, SSR-F 598.

In 1964, 1,866 adult pink salmon from another stream were planted in Sashin Creek. Circumstantial evidence indicated that adult pinks spawning in Sashin Creek in 1966 were mostly progeny of the fish transplanted in 1964. Mr. Ellis describes the study area, and the number, time of migration, distribution, and fecundity of the spawners.

--Barbara Lundy

WHAT IS "FISH FARMING" AND WHERE IS IT PRACTICED?

For the most part, man's role is still that of a hunter rather than a farmer of the sea. In the future, however, it is probable that food shortages will require regulation of the life cycles of marine animals and plants in much the same way as on land. This might include altering the bottom environment, hatching of fish eggs, fencing breeding areas, fertilizing plants, and use of drugs to control diseases.

Japan has developed fish farming and aquaculture to a higher degree than any other country. Fish-farming centers have been established in the Inland Sea to offset the decrease in catch of high quality fish in coastal waters. Eggs are hatched and fry released into the waters of the Inland Sea.

By growing oysters on ropes hanging from rafts, the Japanese have increased the yield per acre to 50 times that of conventional methods. Oyster culture is also highly developed in the Mediterranean Sea where oysters are harvested from sticks thrust into the shoal bottom.

Off the coast of California old streetcars and automobiles have been dumped into the ocean to form artificial reefs to attract fish.

Possible methods of fencing sea areas include the use of nets, electrical impulses, and ultrasonics.

Fertilizers have been used experimentally in enclosed areas of the sea, but they have stimulated growth of weeds and unwanted species as well as of desirable fish. ("Questions About The Oceans," U.S. Naval Oceanographic Office.)

INTERNATIONAL

THE FAO FISHING FLEET

The United Nations Food and Agriculture Organization (FAO) operates one of the world's largest fishery research fleets. Its 28 vessels are found in nearly all oceans, in many seas, and in 4 large African lakes. Easily recognized by their brilliant blue stack with the UN insignia painted on both sides, each flies the flag of the country in which it is registered, although all are home-ported in Rome. They are manned by FAO experts and nationals of the countries they serve.

The vessels are used in FAO/UNDP fishing programs in 15 developing nations, and 3 regional projects that embrace 23 countries and territories. These include Argentina, Colombia, Pakistan, Ghana (Lake Volta), India, Korea, Zambia (Lake Kariba), Mexico, Nigeria, the Philippines, Senegal, Sierra Leone, Singapore, the UAR (Lake Nasser), S. Vietnam, Caribbean countries, Central America, and around Lake Victoria in Africa.

The Vessels

Each vessel has been designed by an experienced naval architect in the Boats and Equipment Section in collaboration with other branches of FAO's Fisheries Department. Most have been designed for particular projects, but all are versatile. They are used for experimental and exploratory fishing, scientific investigations, demonstrations of fishing techniques, training fishermen and mechanics, and for many other purposes.

They range from a pair of 8.23 meter catamarans in Lake Kariba to a 44.28 meter US$300,000 "Japanese-type" tuna longliner in Korea. Many cost more than similar commercial fishing vessels because of their specialized equipment and instruments. However, nearly all are fishing boats rather than sophisticated research vessels.

Latest Equipment

Twenty-three have steel hulls, 4 have reinforced plastic hulls, and one is wooden. Ship's complement--crew, scientists, and trainees--runs from 4 to 60. Their propulsion systems vary from 80 to 800 hp; the engines are manufactured in factories around the world. Many are equipped with the latest electronic, navigational, and fish-finding devices--radar, sonar, echo sounder, directional compasses, loran, radiotelephone, automatic pilots, and various winches and catch-handling gear. Some also have well-equipped scientific laboratories. Equipment is selected according to specific needs.

Over $5-Million Fleet

The cost of building, equipping, and delivering this fleet now exceeds US$5 million. The money is contributed by the UN Special Fund and participating governments. Nine were built in England, 8 in Japan, 5 in Holland, 4 in Norway, and 2 in Mexico. The first was built in Japan in August 1965. The two newest, also built in Japan, were to be delivered to the Korean Training Center for coastal fishing in 1969. The shipyards deliver them anywhere. They navigate under their own power, ride as cargo on other vessels, and are even sent by truck (for example, a boat destined for Lake Victoria).

Boats Leased Too

FAO also uses all types of leases and secondhand boats. During the past 3 years, about 8 have been used. One, a leased boat, is investigating pelagic fishing under a regional fishery project that will benefit nearly all West African nations.

The architects are kept busy designing new vessels as new assistance plans are drawn. Twelve are being planned or considered.

FAO SCHEDULES SECOND WORLD FOOD CONGRESS FOR JUNE 1970

FAO has scheduled the Second World Food Congress for June 16-30, 1970, in the Netherlands. The first phase will assess the world food situation, within framework of overall economic development; it will propose priorities for action. The second phase will discuss how to find the resources necessary for the action.

8 Commissions

The debate will be conducted in 8 commissions. The 4 commissions of Phase I are based on the vital factors in national development. The first commission will focus on ensuring food supplies; the second on higher living standards and improved diets; the third on people in rural development. FAO notes that populations are rising faster than job possibilities--even with the drift to urban areas. The number of people who make their living in rural areas is rising steadily.

Developing Trade

The fourth commission will consider ways of strengthening trading position of developing countries and increasing their export earnings. Their vital export trade is almost entirely agricultural products.

Phase II

Phase II will face the implications of proposals made in Phase I and concentrate on finding ways and means of carrying them out.

FISH-MEAL MANUFACTURERS EXAMINE WORLD TRENDS

Fish meal is in short supply. This was the major finding in an examination of world production, sales, and consumption at the 9th Annual Conference of the International Association of Fish Meal Manufacturers (IAFMM).

As a result, prices have risen to high levels. Some members are concerned that fish-meal sales will suffer and inventories accumulate.

Reasons for Production Decline

The production decline is attributed to the failure of the fish to appear in their usual areas off Peru and, to a lesser extent, in Scandinavia. (Regional Fisheries Attaché, U.S. Embassy, Copenhagen, Oct. 17, 1969.)

FROZEN GROUNDFISH SUPPLIERS MEET

Government officials from Canada, Denmark, Iceland, and Norway held the third meeting in a series of major world suppliers of frozen groundfish in Ottawa, Oct. 15. The series began in Copenhagen last March.

Reviewing the current world situation, they noted the market had been able to retain the basic strength and stability evident through most of 1969. They agreed that production and trade in general have improved, while end-product consumption has increased rapidly in the principal world markets.

Forecast 1970 Stocks

Examining the medium-term outlook, they concluded that current stock levels are normal. But with peak production period past, and consumption rapidly increasing in major importing markets, world stocks may be very low by first-quarter 1970. This should further strengthen the market.

The participants agreed to keep world production and market trends under review and to consult periodically. (Dept. of Fisheries and Forestry, Canada, Oct. 16, 1969.)

JAPAN-MEXICO FISHERY CONFERENCE ENDS

Delegates from Japan and Mexico met in Mexico City, Sept. 29-30, 1969, to discuss their fishery agreement. In effect since June 10, 1968, the agreement covers Japanese fishing inside Mexico's 12-mile exclusive fishery zone.

After reviewing operation of the agreement, Mexico did not propose further restriction of Japanese tuna fishing. Japan had anticipated this move in view of the Mexican President's recent statement urging that territorial waters be extended from 9 to 12 miles. ('Suisan Tsushin,' Oct. 4, 1969.)

5 NATIONS SIGN CONVENTION ON SOUTHEAST ATLANTIC

The Convention on the Conservation of the Living Resources of the Southeast Atlantic was formally signed by Cuba, West Germany, Italy, Portugal, and South Africa at a meeting in Rome, Oct. 23, 1969. Belgium, France, Japan, Republic of Korea (South Korea), Spain, and Togo endorsed, but did not sign, the document. Observers from Brazil, Republic of China (Taiwan), Ecuador, Poland, and the U.S. were present.

The agreement becomes effective when ratified, or is otherwise adhered to, by at least 4 states with a combined 1968 catch in the area of 700,000 metric tons. It is open for signature by all interested countries.

Terms of Convention

The convention's 21 articles establish an international commission for the southeast Atlantic fisheries. The commission, aided by a scientific advisory council and regional and stock committees, will study and recommend ways to conserve fish and other living resources in the area.

The convention area runs west and south of the mouth of the Congo River to the Cape of Good Hope and the Indian Ocean. It covers roughly 8 million square miles between 6 and 50 degrees south latitude, and between 20 degrees west and 40 degrees east longitude.

Area Heavily Fished

Fishing in this area has increased 30 times in as many years. It has risen from less than 100,000 metric tons a year before World War II to 2,600,000 tons in 1967, and to 3,300,000 tons in 1968. The 1968 catch value was about US$200,000,000. This increase has seriously strained certain stocks, mainly hake and pilchard. International action is necessary to avoid depletion. The area's tuna and whales already are covered by international agreements.

Predominant fishing countries in the southeast Atlantic are South Africa, USSR, Portugal (Angola), Spain, and Japan. In 1968, South Africa took 2,000,000 tons and the USSR almost 500,000. Other countries are Belgium, Bulgaria, West Germany, France, Taiwan, Israel, South Korea, and Poland.

Need for Conservation Stressed

A Portuguese resolution calling for an expert study of the state of stocks in the southeast Atlantic before the International Commission meets was approved. The resolution warned that certain stocks appear to be heavily exploited, and that conservation measures are needed urgently.

Another approved resolution recommended establishment of 'adequate medical, technical and meteorological services' for protection of fishermen in the area.

After the signing, the South African representative called for speedy action to bring convention into force. He warned of danger of depleting fishery stocks in southeast Atlantic. He added: "We cannot deny that pressures have been building up in our country to seek measures to protect our long-term interests more adequately." (FAO, Rome, Oct. 23, 1969.)

CANADA

HUNTING BABY SEALS
BANNED IN 1970

Canada will ban the hunting of 'whitecoats' (baby harp seals) in the Northwest Atlantic in 1970. It is hoped the Norwegians will adopt a similar ruling. This would make ban effective in the Gulf of St. Lawrence and on the Labrador Front. Norway has been the only other country actively fishing harp seals in the Northwest Atlantic in recent years.

Under the ban, only 'beaters' (animals up to 80 pounds, and well beyond the 'whitecoat stage') may be taken. No longer accompanied by their mothers, they swim or 'beat' north to Arctic waters.

New Regulations

The hunt will have a later opening date. The use of aircraft, including helicopters, will be prohibited. Commercial operations will be confined almost entirely to ships. However, individual landsmen, walking out from shore, also will be allowed to take 'beaters' during open season. Because 'beaters' are far more mobile than baby seals, they will be hunted with rifles instead of clubs.

Advantages of Ban

The new regulation does away with the most offensive characteristics of the sea hunt. It also protects Canadians dependent on the seal fishery for a living. The sealing vessels employ mainly Newfoundland fishermen. The landsmen from Quebec and the Maritime Provinces also will gain because 'beater' skins now are more valuable than the smaller 'whitecoats.' (Canadian Dept. of Fisheries and Forestry, Oct. 15, 1969.)

* * *

MARITIME PROVINCES LAND
BILLION POUNDS IN FIRST 9 MONTHS

One billion pounds, worth C$58.1 million were landed in the Maritime Provinces (N.S., P.E.I., N.B.) in first 9 months 1969. In same period 1968, landings were 1.1 billion pounds, worth C$57.4 million; in 1967, 855 million pounds, worth C$47.9 million.

September Landings

September landings were 163.4 million pounds worth C$7.2 million--51.9 million pounds of groundfish (C$2.4 million), 106.2 million pounds of pelagic and estuarial species (C$1.9 million), and 5.3 million pounds of shellfish (C$2.9 million). (Canadian Dept. of Fisheries & Forestry, Nova Scotia, Oct. 23, 1969.)

EUROPE

USSR

PURSE SEINING FOR COD & WALLEYE POLLOCK DEVELOPS IN FAR EAST

TINRO is introducing purse seining for cod and walleye pollock to the Soviet Far Eastern fishing fleet. The fleet operates in the Gulf of Anadyr (northern Bering Sea) and off West Kamchatka.

TINRO is the Soviet Pacific Fisheries and Oceanography Research Institute. It also plans to introduce purse seining for mackerel, tuna, sardines, and horse mackerel. So far, the Soviets have been seining only for herring in the Pacific. Purse seining for cod differs from herring in exploratory techniques and transshipment of catch to factoryships.

Purse-Seining Cod

Cod is a groundfish. Its schools are better detected by hydroacoustic devices than by conventional fish finders. Casting the purse seine following echo-sounder readings requires considerable experience. Soviet Far Eastern fishermen are now being trained in the new technique. Catches must be transshipped simultaneously to 2 or 3 vessels because cod are filleted as seines are emptied, and this takes time.

Large concentrations of cod and walleye pollock were discovered in the Gulf of Anadyr at 70-80 meters.

TINRO To Scout Fish

To prevent the commercial fleet from wasting time looking for fish, TINRO will assign one exploratory vessel to scout northwestern Bering Sea (off Soviet Coasts) from May 15. Another exploratory vessel will join in June. Due to weather, the fishing season in Gulf of Anadyr is from June to October. ('Rybnoe Khoziaistvo,' No. 9, 1969.)

* * *

HOPES TO IMPROVE AT-SEA CATCH TRANSFERS

The Fisheries Ministry has announced a contest for the best method of "contactless" at-sea catch transfer. The Ministry hopes to discover an efficient at-sea transfer technique eliminating side-by-side anchoring. Present practice frequently damages vessels and causes delays while vessels await favorable weather and sea conditions. A "contactless" method would permit one-way transfers of 20 metric tons an hour in rough seas (winds up to 46 miles an hour).

Big Prizes

The contest, cosponsored by Scientific and Technical Society of the Food Industry, and Food Industry Workers' Trade Union, will award 7,750 rubles (US$8,525) in prize money. First prize is 2,000 rubles ($2,200). The contest closes June 1, 1970. It is limited to Soviet citizens. ('Rybnoe Khoziaistvo,' No. 8, 1969.)

* * *

TANKERS USED TO TRANSPORT FISH MEAL

Tankers supplying the Atlantic fishing fleet with fuel and water carry fish meal in the emptied holds on their return trips.

With recently improved transfer techniques, all 4 stern hoists of a stern factory trawler (BMRT) are used to lift nets with 50-60 110-pound fish-meal bags and lower them into the tanker's storage space. Using this method, 120 metric tons can be transferred in 8 hours. ('Rybnoe Khoziaistvo,' No. 8, 1969.)

* * *

OIL-SPILL "CLEANING" VESSEL IS BUILT

The Soviets have announced construction of an oil-spill "cleaning" vessel capable of collecting from the sea surface up to 7 metric tons of oil in one hour. Aptly named 'Sanitar,' she is the prototype of a class. (TASS, Moscow, July 29, 1969.) No additional details are available.

U.S. Model Tested

The U.S. Technocean Company announced that it has tested a small-scale model of a craft designed for the same purpose. The

USSR (Contd.):

17,000-ton vessel will be a 'hybrid': its forward section will have a conventional single hull; aft, it will be a catamaran. It will move backwards, suck up the water with the floating layer of hydrocarbons at a rate of 62,905 (or 10,000 tons) an hour, separate the oil, and pump the clean water back into the ocean.

Ocean Research Too

According to the designers, the space between the twin hulls of the catamaran portion can be used for high-seas oceanographic research and for operations with small submersibles or bathyscaphes. ('Ocean Industry,' Oct. 1969.)

* * *

SPORT FISHING DEPLETES COMMERCIAL STOCKS

Caspian Fisheries Research Institute (KASPNIRKh) scientists blame the stock depletion of Caspian roach, Rutilus rutilus caspicus, on sport fishing.

Caspian roach (vobla), a silver-white European cyprinid fish, is one of the most valuable commercial species of the Volga-Caspian region. KASPNIRKh's efforts to protect the stocks, by reducing net-mesh size in autumn and increasing it in spring, have been defeated by anglers who take small fish (3-year-olds, spawning for the first time) in the spring, and large fish (4-year-olds entering commercial resource for first time) in the autumn. The spawning stock reproduction decreases and abundance of future year-classes cannot be assessed.

Many Angler Groups

In January 1966, 2.3 million Soviet sport fishermen were listed in societies and organizations. There are many more who are nonmembers. In the USSR, sport fishing is free to all citizens. There, unorganized fishermen nullify the measures taken to protect and increase the stock.

Expanding sport fisheries are likely to become a major problem for Soviet commercial fisheries in addition to the Caspian or Bolga Delta. ('Rybnoe Khoziaistvo,' No. 8, 1969.)

* * *

STERN FACTORY TRAWLER EQUIPPED WITH UNDERWATER ELECTRIC LIGHTS

For the first time, a large stern factory trawler of the Northern Fisheries Administration (SEVRYBA) has been equipped with underwater searchlights, fish traps, and special catch-lifting gear. She will fish off West Africa. Heretofore, only medium trawlers have practiced underwater electric-light fishing. (TASS, Moscow, Oct. 10, 1969.)

* * *

FISHERIES MINISTER DENIES SOVIETS FISH SALMON OFF BRITISH COLUMBIA

After 2 Soviet trawlers had been arrested inside the 12-mile limit off Vancouver Island, rumors persisted among Canadian fishermen that the Soviets had been fishing salmon. Fisheries Minister Jack Davis and Fisheries Department officials flew over the Soviet fleet on August 11, 1969.

Soviet Trawlers Photographed

Fish aboard Soviet trawlers were photographed. Fishery biologists from Nanaimo Laboratory studied enlargements and determined that the catches were "silver-sided rockfish". Those glisten with a silvery sparkle like salmon, but are easily distinguishable from salmon by their round, flat shape.

Not Taking Salmon

The Minister said "there is no indication that the Soviet fleets are taking Pacific salmon." However, some claim that the Soviets may be taking salmon as incidental catch because this also happens to Canadian fishermen. ('Western Fisheries,' Aug. 1969.)

* * *

SOVIETS CONCERNED ABOUT CARELESS FISHING-VESSEL OFFICERS

An official of the Soviet Sakhalin Fisheries Administration has complained about the careless and scornful attitude of officers and engineers aboard fishing vessels that results frequently in vessel damage.

In September 1968, the factoryship 'Sovetskii Sakhalin' ran aground in Terpenie Bay

USSR (Contd.):

(southeast Sakhalin) off Cape Obshirnyi. Visibility was excellent, and the vessel was equipped with the latest electronic navigational instruments. An inquiry revealed that the first mate had changed the vessel's position twice without informing the captain; no watch officer had bothered to check the vessel's coordinates, and the third mate determined her position "by ear" and entered it in the log. The inquiry board ruled this accident "the result of criminal negligence on the part of the navigation officers, and a deplorable performance of the officers' duties."

Tanker Hits Bottom

The tanker 'Ursul,' en route from Korsakov to Nevel'sk (southern Sakhalin), hit bottom in Aniva Bay off Cape Anastasia. When the accident occurred, the second mate was drunk and had left the bridge without authorization. When the vessel was crossing the dangerous area, the captain himself was not on the bridge.

Fishermen, Not Seamen

The fishery official complained that crew members, old and young, frequently feel they are fishermen, not seamen. So they see no need to keep up navigational rules and traditions dear to seamen. Responsibility for this attitude is the navigation schools', which teach and train officers and specialists for the fishing fleet.

The official added that conspicuously absent at the Sakhalin School of Navigation, for instance, is a course in marine ethics stressing old traditions, discipline, and behavior. Instead, students readily adopt bad habits--"smartness and drinking while getting one's feet wet."

Of greatest importance is the example set by the captain, first mate, or chief engineer. Skippers "appearing on the bridge in a cloud of alcohol fumes" are bound to depress and demoralize the crew. ('Vodnyi Transport,' Oct. 18, 1969.

* * *

TOP-LEVEL FISHERY ECONOMISTS CONFER

Soviet fishery executives met in Sept. 1969 to discuss: fisheries expansion; catch efficiency; new planning methods; results of the economic reform; economic stimulation in fisheries production; and improving bookkeeping, accounting, and economic analysis in the fishing industry. ('Rybnoe Khoziaistvo,' No. 7, 1969.)

Economic Reform Implemented

The Fisheries Ministry is one of 22 that have implemented economic reform throughout; 23 are still lagging. ('Ekonomicheskaia Gazeta,' No. 35, Aug. 1969.)

* * *

FISHERY SUMMIT MEETING HELD IN LENINGRAD

Members of the Joint Commission on the Development of High-Seas Fisheries (Bulgaria, East Germany, Poland, Rumania, and the USSR) held a 10-day meeting in Leningrad September 1969.

They discussed coordination of fishery research, rational utilization of fishery stocks, fishing vessel construction, gear, equipment and automation. They also reviewed fisheries cooperation during the past 2 years. (TASS, Sept. 18, 1969.)

* * *

EXPORTED \$6.3 MILLION OF MARINE PRODUCTS TO JAPAN IN 1968

Japan imported over 28,000 metric tons of fishery products worth about US\$6.3 million from the Soviet Union in 1968. Both quantity and value were down from 1967, a

Soviet Exports to Japan, 1967-1968

Commodity	1968 Quantity	1968 Value	1967 Quantity	1967 Value
	Metric Tons	US\$ 1,000	Metric Tons	US\$ 1,000
Fresh or frozen:				
Herring	4,277	717	3,365	534
Shrimp, northern	1,418	303	9,835	3,213
Other	9,666	2,267	15,619	2,058
Total	15,361	3,287	28,819	5,805
Dried, salted, or smoked:				
Cod roe	563	322	277	151
Herring roe	200	415	97	178
Other	2	1	819	134
Total	765	738	1,193	463
Canned	187	233	252	551
Oils and fats	574	58	432	65
Fish meal	11,488	2,013	6,320	1,002
GRAND TOTAL	28,375	6,329	37,016	7,886

USSR (Contd.):

peak year for Soviet fishery exports to Japan. The largest decreases were in "northern shrimp" and "other fresh and frozen products."

Northern Shrimp

The Soviets catch small North Pacific shrimp off Alaska, around the Shumagins on Portlock Banks, and in Anadyr Bay. The decrease in northern shrimp imports was reportedly caused by Japanese unwillingness to pay the prices demanded by DALINTORG, the Soviet Far Eastern fisheries trade firm.

Each year about 40,000-45,000 metric tons of fresh Alaska pollock are transshipped to Japanese fish-meal processing vessels in the Sea of Okhotsk. ('Suisan Tsushin.')

* * *

PNEUMATIC FISH-MEAL CONVEYORS BEING DEVELOPED

Pneumatic conveyors to transport fish meal and bulk storage of fish meal have been given top priority for successful fishing industry development in the USSR.

In 1966, the Azov-Black Sea Fisheries and Oceanography Research Institute (AZCHERNIRO) conducted granulometry, volumetry, viscosity, and suspension-velocity studies with 8 different samples of fish meal. The meal had been produced by large stern trawlers ('Maiakovskii' and 'Tropik' classes) of the Sevastopol High Seas Fisheries Administration. The tests were made to determine the most desirable characteristics for pneumatic conveyors and the best facilities for bulk storage. ('Rybnoe Khoziaistvo,' No. 9, 1969.)

* * *

FORBIDS CONTINENTAL SHELF RESEARCH OFF NORTHERN COAST

The Soviets have refused to allow a British research trawler, 'Ernest Holt,' to carry out seabed investigations off their northern coast. The vessel was to have drilled for specimens up to 25 miles offshore. The Soviets said one of their own research vessels was doing identical work in the area. The results would be given to Britain, if requested.

Contravenes Geneva Convention

Permission was refused despite British citation of an article in the 1958 Geneva Convention on the Continental Shelf stating that "qualified institutions" must not be denied permission to do scientific research on the Continental Shelf.

The Vessel

The 177-ft. Ernest Holt was built in 1949. Based at Grimsby, she has carried out much of Britain's Arctic fishery research. ('Fishing News,' Nov. 7, 1969.)

* * *

PROPOSES ELECTRICAL FISHING FOR SALMON IN FRESH WATER

PINRO (Polar Institute of Fisheries and Oceanography at Murmansk) scientists have proposed catching salmon in fresh water with an electrical fishing device.

Some scientists believe salmon become confused by the electric current, "lose their bearing," and then can be guided easily into nets by an electric field.

PINRO scientists have experimented for several years. They found the technique successful. The fish were landed undamaged. (TASS, Sept. 24, 1969.)

* * *

FISH MEAL EXPORTS DROPPED IN 1968

The USSR exported only 28,000 metric tons of fish meal in 1968--21.6% (7,700 tons) less than the 35,700 tons in 1967.

Increasing domestic demand and lower prices abroad may have reduced 1968 exports. In 1967, an average ton of fish meal brought 131.4 rubles (about US$145); in 1968, only 121.4 (US$135). As a result of lower prices and smaller quantity, 27.6% less in foreign currency was obtained in 1968 than in 1967.

Exports to W. Germany Drop

The large decrease in 1968 exports of fish was due entirely to declining exports of fish meal to West Germany. These dropped from 15,500 tons in 1967 to 5,900 in 1968.

USSR (Contd.):

The loss was offset somewhat by additional exports to other countries.

Whale Oil Exports

Whale oil exports remained relatively stable; quantity rose but value dropped. ('Vneshniaia Torgovlia,' SSSR, No. 8, 1969.)

Exports of Fish Meal & Whale Oil, 1967-1968

Item	Quantity		Value	
	1967	1968	1967	1968
	1,000 Metric Tons		1,000 Rubles--Officially one ruble equals US$1.11	
Whale oil	57.6	59.0	6,969	6,841
Fish meal	35.7	28.0	4,693	3,400

UNITED KINGDOM

FISHING INDUSTRY EXPERTS FORECAST TO 1975

The Fishery Economics Research Unit of the British White Fish Authority has forecast the size, structure, and profitability of the British industry in the mid-1970s. It did this at the FAO Conference on Investment in Fisheries in Rome, Sept. 18-24, 1969.

The forecast indicates that the distant-water trawler fleet will total 55 to 60 vessels. The near- and middle-water fleets will be only slightly smaller than now. The inshore fleet may increase about 15%.

White Fish Decline

By applying expected catch rates to assumed capacity of the fleet's different sections, total landings of white fish may decline 15% to 20% below present level.

Consumption of fish also may decline, but at a slower rate of 0.6% to 1.3% a year. Prices may rise. Imports would tend to increase at a rate of 2.9% to 3.4% a year. ('Fishing News,' London, Oct. 17, 1969.)

* * *

LAB WILL STUDY EFFECTS OF THERMAL POLLUTION

Britain's Central Electricity Generating Board has built a marine biological laboratory beside the 2,000-milliwatt power station at Fawley. The laboratory will study effects on marine environment of heated water from power stations.

Biochemical Tests

Starting at the bottom of the food chain, effects on productivity of phytoplankton will be estimated under various conditions, according to the amount of carbon-14 assimilated. Various organisms, including the American clam, will be analyzed biochemically for relative contents of amino acids, peptides, enzymes, etc. Eventually, it may be possible to define effects of heating on specific enzyme systems. This work is to be carried out in conjunction with measurements of heat flux of the intertidal environment. The researchers intend to examine animals from particularly warm localities.

Chemical Tests

Chemists will use an autoanalyzer to look for long-term changes in sea water caused by organic nutrients. About 1,500 sq. ft. of laboratory space will be devoted to biochemistry, chemistry, ecology, physiology, and plankton. A 2,000-sq.-ft. aquarium building will receive warm sea water from the power station's outfall and cold sea water from the intake.

No Quick Results Expected

Rapid results are not foreseen because much needs to be learned about natural fluctuations in marine communities before the effects of power stations can be gauged accurately. It is hoped findings will show heated water discharged by power stations is not harmful to the sea environment. ('Nature,' Oct. 11, 1969.)

* * *

AIDS FISHERIES IN DEVELOPING COUNTRIES

United Kingdom aid to fisheries in developing countries is about US$240,000 a year. It is given directly through projects initiated and carried out by the Ministry of Overseas Development. This aid will continue at present level.

UNITED KINGDOM (Contd.):

Favors Multilateral Aid

In the future, however, if the country's balance of payments position improves, the government intends to make any additional aid multilateral. It may be interested in proposals to establish a World Fisheries Bank. ('Fishing News,' London, Oct. 17, 1969.)

NORWAY

'FRIONOR' MAKES IMPACT ON WORLD FISH MARKET

Twenty-three years ago, 136 frozen fish fillet producers recognized that even the largest Norwegian factory was small internationally. They established Frionor. Two of the country's largest firms--a private bank and an insurance company--joined them to launch Frionor with a modest share capital of 2.5 million kroner (about US$360,000).

World-Wide Sales

Frionor now exports to 30 countries. It manages its own production and sales branches in the U.S., Australia, Kenya, and Great Britain. It manages a fish shop in Prague. Frionor scored its greatest successes on the U.S. and Australian markets. Sales increases to EFTA countries also have been remarkable--despite the 10% extra tariff Britain imposed last autumn on all frozen fish from Scandinavia.

Export Explosion

In 1968, Frionor's turnover was 240 million kroner (about US$34.3 million). During first 8 months of 1969, despite unrest and uncertainty on world credit markets, exports increased up to 48.5%. A turnover increase equalling the export growth is expected for 1970.

Plant Capacity & Productivity

The export growth was backed by a 39% production increase that involved neither new investments nor new plants. The extremely flexible production system would permit a 50% increase without increasing plant capacity. Frionor's system, horizontal and vertical for fishermen, manufacturers, and marketing groups, is completely integrated; the 3 groups are not isolated.

Total Catch Utilization

Frionor has been able to exploit catches almost totally because of its success on more new markets. Cod, coalfish, rosefish, and mackerel completely dominated production a few years ago; today, Frionor sells many once-unused species, including lumpfish, blue halibut, porbeagle shark, and all kinds of shellfish. (Export Council of Norway, Oct. 1969.)

* * *

DRIED COALFISH USED FOR DOG FOOD

Dog food from dried coalfish--saithe or pollock--is fast becoming a large export item. A Norwegian firm in Aalesund has produced this type of dog food for several years. In 1968, its sales reached US$285,000.

The largest dog food market is in Sweden, but Germany and Denmark also are buying more. ('Fiskeribladet,' Sept. 19, 1969.)

DENMARK

FAROESE REBUILDING FISHING FLEET

The Faroese fishing fleet is changing. The change began in 1960 when large investments were made in so-called longline vessels of 250 to 400 tons. At that time, the entire fleet--55 longline vessels and 10 trawlers--was based on the cod fishery. The catch was salted for exports to southern Europe, South America, and Africa.

Switch to Herring

In 1965, several longline vessels were equipped with power blocks and large purse-seine nets patterned after Norwegian and Icelandic types. These vessels entered the herring fishery ranging from North Sea to Jan Mayen, north of Iceland. The Faroese herring catch increased from 20,000 metric tons in 1964 to 62,000 tons in 1968. This gave rise to a new industry, fish meal--although

DENMARK (Contd.):

half the herring were used for human consumption. Fish-meal factories have become even more important since the Faroese began fishing sand eel (launce), an important raw material in Danish fish meal.

Frozen-Fillet Production

The factoryship 'Stella Kristina' (2,000-3,000 tons) was delivered by a Norwegian shipyard a few months ago. She has a daily freezing capacity of 36 tons and, perhaps, an annual output of 2,000 tons of frozen fillets. Her entire production to 1970 already has been sold to U.S. buyers. Three sisterships have been ordered from a Norwegian shipyard for US$7 million. The State will contribute 15%; Norway gives a 7-year credit for 75%; the owners will pay 10%.

Further Fleet Expansion

The Faroese plan to add a new trawler every 12 months until 1975, and one every six months from 1975 to 1980. Their catch is expected to yield 30,000 metric tons frozen fillets in 1975 and 120,000 tons in 1980. ('Dansk Kiskeritidende,' Oct. 23, 1969.)

ICELAND

CATCH, EXCEPT HERRING, RISES

Except for herring, Iceland's catch through July 1969 was considerably better than in 1968. It has been a record capelin year--171,000 metric tons from January to April, more than double the 1968 catch, and exceeding the 1966 record of 125,000 tons. In the absence of substantial herring landings, the capelin has been used as a low-quality substitute in reduction plants.

Poor Herring Catches

The poor herring catch was the only bad news: only 15,000 tons through August. It had been 50,000 tons in same period of 1968, the worst year in recent times. A mitigating fact is that salted herring tonnage reportedly was about the same as 1968's, and price was generally higher.

Increased Export Value

The shift in emphasis from relatively low-value herring oil and meal to white fish also contributed to an increase in value of fish exports from January through July. This was US$46.4 million, compared to $40 million in same period of 1968.

The increase in export value is attributable to white or ground fish. An extremely good catch and better white fish prices and U.S. markets benefited export earnings. This improvement was reflected by changes in the frozen fillet trade. More fillets were being prepackaged in Iceland; fewer were exported in blocks or slabs for processing in the U.S.

White Fish Catch Increases

Preliminary January-August data indicate white fish catch in 1969 will be 16% higher than in 1968; by September, it may have equalled the 1966 and 1967 catches. The improvement over 1968, one of Iceland's best white fish years, apparently prevailed in both spring (January-April) and summer (May-August) seasons. The increases were 13% and 21%. (U.S. Embassy, Reykjavik, Oct. 1, 1969.)

FRANCE

MAY SUPPORT FRENCH-AFRICAN TUNA INDUSTRY

France may support the tuna industry of French-African countries, according to "La Vie Economique," Aug. 22, 1969.

France, Senegal, the Ivory Coast, Republic of Congo (Brazzaville), and the Malagasy Republic are members of a group that meets twice a year to make decisions on the French tuna market. These countries set prices to be paid to vessels for raw tuna, market prices for canned tuna, and quotas for canners and for individual countries.

There is a French tariff of 24.6% on canned tuna imports according to the General Agreement on Tariffs and Trade (GATT). Despite this, tuna is imported into France under quotas established for several countries, including Morocco.

FRANCE (Contd.):

Situation More Critical

Representatives of the 5 countries met in Oct. 1968. They were told that the French market could absorb only 40,000 metric tons of tuna--and that expected 1969 production would be around 46,000 tons. Sale of excess production is complicated because French vessels and fishermen are guaranteed higher prices than those received by other countries. The situation is becoming more critical as the tuna fleets of France, Senegal (and, in 1970, the Ivory Coast) continue to add new and more effective vessels.

What Article Says

The articles says in part:

"As far as canned tuna is concerned, the duty applicable to imports from third countries is 24.6 percent. The system of quotas is also very strict, and only Yugoslavia is allowed a quota which amounts to 900 tons. It is true that canned fish prepared in Senegal and other African countries tied to France by cooperation agreements is imported free of duty, but it should be noted that this canned fish is prepared almost exclusively from the catch of the French fishing fleet and processed in Africa by canneries in Senegal in which French canners own very important shares. Furthermore, these African countries, although allowed customs-free entry for fish, as well as for their other products, have agreed to continue to respect the limitation of their exports to the amount of a quota which is fixed every year in a conference between the countries concerned.

"This quota, which was 13,500 tons in 1966, and 12,500 tons in 1967, was raised to 15,400 tons in 1968, an increase which fails to reflect the progress of the French and Senegalese catch."

Discuss Common Policy

"In order to absorb the surplus and avoid flooding the French market for canned fish, the Senegalese Tuna Fishing Company has just agreed to export, during the current fishing season, 1,800 tons of frozen tuna to countries other than France. On the Community level, the search for protection can only result from a common policy. The rules of a common policy which are now under discussion among the member countries provide for a system of price guarantee for tuna which, if adopted, should enable the canners to obtain their fish supplies from the French catch at prevailing world prices, and to secure at the same time a fair income to fishermen.

"It is foreseen that canned tuna, as well as sardines, will be subject to a minimum import price." (Regional Fisheries Attaché, U.S. Embassy, Abidjan, Oct. 6, 1969.)

* * *

NEW TUNA SEINER COMPLETES SHAKE-DOWN

A new tuna seiner, 'Jacques-Coeur,' completed fishing trials in early September 1969 off Concarneau. Third of her class, she was designed for maximum productivity.

She is 154 feet long; 35 feet wide; her 800-hp engine can make 14 knots; daily freezing capacity is 50-60 tons; hold capacity is 375-400 tons; at-sea time is at least 55 days, and she is valued at about US$1.1 million, equipped. Under a new agreement for large tuna vessels, her 18-man crew will rotate so that onefourth will always be on 45-day shore leave.

Could Double Seiner Catch

Jacques-Coeur's fishing grounds are more than 4,960 miles from Concarneau. She is expected to land 2,500-3,000 tons of tuna a year. In 1968, the best catch made by the preceding seiner class was 1,475 tons. ('Le Marin,' Sept. 19, 1969.)

SPAIN

FROZEN HAKE FILLETS PRODUCED FOR U.S. MARKET

A new Spanish trawler, 'Ila,' is processing and packing frozen hake fillets for the U.S. market. This was reported by the managing director of Congeladores del Atlantico, the trawler's owner. The firm also owns 4 other trawlers fishing off South West Africa. It has about 30 fishing out of Las Palmas.

SPAIN (Contd.):

New Class

The 1,500-gross-ton vessel, completed earlier this year in Vigo, is 249 ft. long and has a $39\frac{1}{2}$ ft. beam. Her engine is 2,670 b.ph. diesel. With a crew of 45, Ila is considerably larger than the earlier class of Spanish trawler now operating off South Africa. She is the first in a series of 8; three are now under construction. Her owners also are building a series of tuna vessels for equatorial waters.

New Export Product

The managing director said Spain is building an important export market for fish products. The new pack being produced by the Ila is expected to prove popular on the U.S. market. ('South African Shipping News and Fishing Review,' Sept. 1969.)

WEST GERMANY

INTEROCEAN '70 SLATED

The advisory committee for Interocean '70 has been named. The chairman is the president of the Deutsche Hydrographische Institut, Prof. Dr. Roll. The committee is scheduled to meet in Dusseldorf or Hamburg in December 1969.

Interocean '70

The Congress will have 6 principal themes: exploitation of the sea's nutritional resources; exploitation of the sea's mineral resources; pollution prevention; application of oceanology to shipping and shipbuilding; protection of the coast and coastal waterways; systems and components for oceanology research and techniques, and 20 sub-themes. Each of the 20 will have a chairman or discussion leader; some already have been selected.

To Obtain Information

Conference languages will be French, English, and German, with simultaneous translation. Requests for further information on authors and papers should be addressed to Dr. Roll or Dr. Weichhardt, Hamburg, Federal Republic of Germany. (U.S. Consulate, Dusseldorf, Oct. 3, 1969.)

HOW MUCH ELECTRICITY DOES AN ELECTRIC EEL GENERATE?

Although the electric eel (which isn't a true eel) is the best known generator of electricity, there are at least 500 kinds of fishes that generate appreciable amounts of electricity. The electrical discharge serves to stun prey and repel attackers.

The average discharge is more than 350 volts, but discharges as high as 650 volts have been measured. Current is low, usually a fraction of an ampere; however, brief discharges of 500 volts at 2 amperes have been measured, producing 1,000 watts. Although direct current is produced, it may be discharged as frequently as 300 times a second.

Severity of the shock depends on the size and state of health of the fish. Voltage increases until the eel reaches a total length of about 3 feet; after that, only amperage increases. Electric eels in South American waters have been known to grow to a length of almost 10 feet.

Other electric fish are found in other parts of the world. ('Questions About The Oceans,' U.S. Naval Oceanographic Office.)

LATIN AMERICA

PERU

ANCHOVY SEASON IS POOR

Peru's Sept. 1969 catch was extremely poor. October showed no improvement. Regardless of cause--oceanographic, overfishing, or other--it's a poor season for the hard-pressed anchovy industry. Despite exceptional prices--$425 per metric ton on Oct. 24--at least one firm, unable to meet its contracts, has gone bankrupt. Strikes for higher wages are expected.

Fish-Meal Production & Export Stocks, Jan.-Sept. 1967-69			
	1969	1968	1967
		(Metric Tons)	
Production	1,110,937	1,323,995	1,082,138
Exports	1,368,412	1,478,769	1,123,604
Stocks on hand Oct. 1, 1969	99,908	408,306	313,330

Maybe Catch Pause

Scientists may recommend a catch pause in January and February 1970, but if catch doesn't improve, fishing probably will continue until June. (Sociedad Nacional de Pesqueria, Oct. 17, 1969; U.S. Embassy, Lima.)

ECUADOR

DISCOVERS NEW SHRIMP BED

The long-awaited discovery of a deep-water shrimp bed is being proclaimed by exuberant Ecuadorean fishermen. Optimistic early reports placed the bed about 30 miles offshore in 40 to 100 fathoms. It may extend into Peruvian waters south of Manta. Catches of 30,000 pounds by a single boat within two days have been claimed. Catches have been primarily medium, with some large sizes--about 50% brown, P. californiensis, and 50% pink, possibly P. brevirostris.

Record Exports Insured

It is too early to determine the extent of the new find. However, it is certain to insure a record for Ecuador's 1969 shrimp exports. Only companies with large modern refrigerated boats can be expected to benefit. This would include 2 major firms operating with U.S. capital, Empacadora Nacional and Empacadora Alberti. (U.S. Consulate, Guayaquil, Sept. 30.)

CUBA

ACQUIRES 3 FACTORYSHIPS FROM SPAIN

Spain and Cuba have concluded a new exchange agreement. If the Spanish government approves, 'Transimport' of Havana will acquire 3 vessels from a Spanish fleet that has been fishing off South Africa.

The vessels are 'Aracean' and 'Arcos,' owned by Armasur of Cadiz, and 'Pescafria' from Francisco Rodriguez fleet based in Parages de San Pedro.

Vigo-Built Vessels

The vessels, built in Vigo shipyards, have lines for fillet production and fish-meal plants. These Spanish operations, and frozen whitefish production, will be greatly reduced when the vessels leave. After the agreement is confirmed, Spain will build 3 new replacements. ('Industria Pesqueras,' July 1, 1969.)

MEXICO

GULF COAST SHRIMP CONTRACTS SIGNED

Shrimp vessel owners and cooperatives on the Gulf of Mexico have signed a 3-year contract. It became effective Sept. 30, 1969.

Under Mexican law, only members of cooperatives may catch 7 species of fish and shellfish, including shrimp. Although shrimp vessels usually are owned either by cooperatives or private owners, the crew members, in all cases, must belong to a cooperative.

New Contract

Basically, the new contract contains the same provisions as the previous one, except for some increase in payments to the cooperatives.

MEXICO (Contd.):

	Payment in Pesos		
	New Contract	Old Contract	Increase
Payment to Crew--Large Shrimp1/	3.45 per kg.	2.99	0.46
Payment to Crew--Small Shrimp	1.55 " "	1.30	0.25
Administration Costs	0.67 " "	0.65	.02
Crew Wages during Vessel Repairs or Dry-docking	83.00 per day	75.00	8.00
Crew's Food	52.00 " "	48.00	4.00

1/Large shrimp are sizes up to, and including, 21-25 (heads-off) a pound.

Note: One peso equals US$0.08. Crew wages are divided among captain, engineer, cook, and winchman.

The contract applies only to the Gulf of Mexico. There is a different contract for the Pacific Coast. There, after deduction of various expenses, 54% of the catch value goes to the cooperative, and 46% to the boat owner. (Reg. Fish. Attaché, U.S. Embassy, Mexico, Oct. 13, 1969.)

* * *

HOLDS 4TH NATIONAL OCEANOGRAPHIC CONGRESS

Mexico's Fourth National Oceanographic Congress was held in Mexico City, Nov. 17-19, 1969.

A general invitation to participate and to present papers had been extended to both Mexican and foreign scientists interested in marine studies. The papers covered: physical and chemical oceanography; marine meteorology; geophysics, geology, biology, engineering, and fisheries.

Latest Equipment Exhibited

The Congress provided an exhibit area for participants and sponsoring agencies to demonstrate marine-science activities and developments. Some of the latest instruments and equipment designed for oceanographic work also were exhibited. (Regional Fisheries Attaché, U.S. Embassy, Mexico, Oct. 13.)

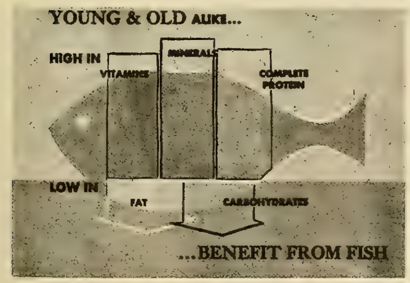
EL SALVADOR

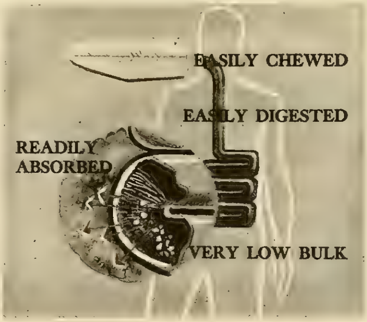
S. KOREANS INVEST IN SALVADORAN DEEP-SEA TUNA PROJECT

In 1968, a Salvadoran Trade Mission visited the Republic of Korea (S. Korea); in February 1969, S. Korean fishery technicians visited El Salvador. As a direct result, S. Korean investors have approved a tuna-fishing development for El Salvador.

US$1 Million Investment

An initial investment of US$1 million, at La Union, reportedly will involve procurement of new docks and warehouses, processing and canning facilities, and larger fishing boats. Some equipment might be supplied by S. Korean manufacturers; probably some will come from other sources, including the U.S. (U.S. Embassy, San Salvador, Sept. 23, 1969.)





ASIA

JAPAN

SOME TUNA LONGLINERS ARE LOSING MONEY

Some tuna longline-vessel owners have been operating at a loss in recent years, according to the National Federation of Japan Tuna Fishery Cooperative Associations (NIKKATSUREN). A NIKKATSUREN study found one-boat owners of 330-360 gross-ton longliners that land their catches in Japan had suffered net losses of about US$13,900 a year from 1963 to 1967.

1967 Compared to 1962

The study uses 1962 as a base year of 100. In 1967, the number of fishing trips a year declined to 73, and catch quantity to 67. Average fish price was 187 but, owing to a catch decline, value of landings was only 126. Sales commissions increased to 122; costs of fuel, water, bait, gear, repair and replacements jumped to 173; and labor to 152. All expenses combined, including taxes, rose to 142. As a result, gross profits in 1967 declined to 81. After deducting depreciation, net losses have run from $11,690-$15,550 a year since 1963.

Dangerous Trend

Equipment and labor costs rose sharply in recent years, while tuna prices, except for bluefin, leveled off. NIKKATSUREN warned that if the trends of the past 2-3 years continue, the very existence of the tuna fishery will be in grave danger within a few years. It urged the government to develop measures to cope with the situation. ('Suisan Tsushin,' Sept. 8, 1969.)

TUNA SEINE FLEET WITHDRAWN FROM EASTERN ATLANTIC

Nichiro Fishing Co. has decided to withdraw its tuna purse-seining fleet from the eastern Atlantic off west Africa. The unprofitable operations and poor efficiency of two-boat seining resulted in cumulative losses year after year. Five pair-seiners and 2 motherships were there in mid-October 1969.

U.S. Seiners Compete

Difficulties were compounded by intense competition from U.S. purse seiners off west Africa. These also sell their yellowfin catches to Italy, till now a very important market for Japan. The efficient U.S. seiners use helicopters to sight fish schools. Each vessel catches 30-50 tons a day.

The Taiwanese, who fish with seiners similar to U.S. seiners, also are reported doing well in the area. Nichiro may build U.S.-type tuna seiners for the eastern Atlantic, primarily to supply Japan's domestic market. ('Kanzume Tokuho,' Oct. 22, 1969.)

* * *

EXPLORATORY VESSEL FAILS TO FIND BLUEFIN IN SOUTHWEST ATLANTIC

The tuna longliner 'Azuma Maru No. 37' (314 gross tons), on a government-subsidized cruise in the southwest Atlantic off Argentina, has been unable to find southern bluefin. Its absence has caused much disappointment. The vessel's scientists now think that southern bluefin spawning grounds may be limited to an area off western Australia.

Earnings & Expenses of 330-360-Gross-Ton Tuna Longliners, 1962-67[1]

	1967	1966	1965	1964	1963	1962
No. of trips per year	22	23	26	26	28	30
Catch (metric tons)	353	370	430	435	455	526
Average price (US$/Short ton)	552	519	388	353	315	295
			(U.S.$)			
Value of landings	214,940	211,920	183,890	169,170	158,000	170,830
Sales commissions	6,440	7,190	6,440	5,250	4,000	5,280
Equipment cost	55,420	44,810	47,670	38,190	37,420	31,940
Labor cost	80,390	71,670	62,500	57,420	49,390	52,780
Other costs	36,220	33,670	40,780	35,530	35,830	35,830
Subtotal of costs	178,470	157,340	157,390	136,390	126,640	125,830
Gross profit	36,470	54,580	26,500	32,780	31,360	45,000
Depreciation	48,160	2/39,440	41,860	48,330	45,940	46,390
Net profit or loss	-11,690	-15,140	-15,360	-15,550	-14,480	-1,390

1/Average of sample operating units.
2/Unverified.

* * *

JAPAN (Contd.):

Finds Bigeyed Off Brazil

In late September 1969, the vessel proceeded north toward 30 to 34° S. latitude and 53° W. longitude, off Uruguay and southern Brazil, to investigate an area where she had found good bigeyed concentrations earlier in the trip. She will return to Japan by way of Cape Town in March 1970. ('Suisancho Nippo,' Sept. 24, 1969.)

* * *

ALBACORE DISCOVERED OFF KURILS

Pole-and-line vessels fishing skipjack tuna unexpectedly encountered albacore near 40° N. lat. and 160° E. long. off the Kurils, north of Japan. They landed about 3,000 metric tons during late August and early September. The fish were small--around 3 kilograms (9.9 pounds)--but discovering albacore in this region has aroused considerable interest among Japanese tuna packers.

Albacore schools off Japan migrate northward with the Kuroshio current, but they are rarely found off the Kurils. ('Kanzume Tokuho,' Oct. 3, 1969.)

* * *

BERING SEA BOTTOMFISH CATCH INCREASES

The 14 Bering Sea bottomfish fleets caught 627,000 metric tons from Jan. 1 through Aug. 22, 1969, 4% above the 608,200 tons for same period 1968.

Alaska pollock catch dropped about 20,000 tons below the 1968 period because of poor fishing from May to June. It later returned to normal levels, but frozen surimi (minced meat) production will be slightly less than estimated originally.

Eastern Bering Sea Bottomfish Catch, Jan. 1-Aug. 22

	1968	1967
	(Metric Tons)	
Alaska pollock	512,800	493,000
Flounder	40,900	84,900
Cod	30,600	27,700
Silver perch	1,250	3,200
Ocean perch	5,450	5,000
Herring	6,900	10,400
Red shrimp	5,300	2,900
Total	603,200	627,100

Since the catch of flounder doubled, total catch for the year should surpass 1968's 843,000 tons. ('Suisan Keizai,' Aug. 26, 1969.)

* * *

EASTERN BERING SEA CRAB FISHING ENDED

The two 1969 Bering Sea crab fleets ended operations in September. 'Keiko Maru' (7,536 gross tons) and 15 catcher vessels left Bristol Bay on the 15th. 'Koyo Maru' (7,658 gross tons) and her 15 catcher vessels finished on the 28th. Keiko Maru carries 6 portable boats; Koyo Maru 4.

Quotas

The 2 fleets had been assigned a combined king-crab quota of 85,000 cases. This was 48% less than the 163,000 cases in 1968. The tanner crab quota was 16 million, about 17,500 metric tons based on individual crab weight of 2.4 pounds.

Profitable Operations

Bristol Bay yielded good tanner catches from the time fishing began in mid-March. This, and good prices (25% above 1968) on the Japanese market, helped the fleet operators maintain profits despite the 48% king crab cut. Nearly all king crab was canned; all tanner crab was frozen, shell on. ('Suisan Tsushin,' Oct. 2, 1969.)

* * *

ONLY 1 SEINER TO TRY FOR E. PACIFIC YELLOWFIN IN 1970

Only one of the 4 purse seiners that failed disastrously in the 1969 eastern Pacific yellowfin fishery will try it again in 1970. She is 'Hakuryu Maru No. 55.' In early October, she was fishing off west Africa.

Two others, 'Hayabusa Maru No. 3' (275 gross tons) and 'Nissho Maru' (252 gross tons) will abstain. Their owners, Taiyo and Nihon Kinkai Hogei, each lost about US$167,000 to $194,000 in the venture. They now consider these vessels too small for economic operation in the fishery. Each has a carrying capacity of about 90 tons and a daily freezing

JAPAN (Contd.):

capacity of about 20. With less than 10-knot speeds, they also lack mobility compared to the 13-14 knot U.S. seiners.

Taiyo plans to build a 700-800-gross-ton seiner in fall 1970 for the eastern Pacific tuna fishery.

4th & 5th Probably Out

The fourth seiner, 'Gempuku Maru No. 82' (500 tons), probably will not enter in 1970. She has not cancelled her North Pacific purse-seine fishery license, so it is doubtful that she would be able to depart for the eastern Pacific before the end of 1969.

A fifth seiner (210 gross tons) was licensed, but did not enter, the 1969 fishery, and is unlikely to enter in 1970. ('Shin Suisan Shimbun Sokuho,' Oct. 2 & 9, 'Katsuo-maguro Tsushin,' Oct. 6, 1969.)

* * *

MANY COUNTRIES SEEK JAPANESE HELP IN SHRIMP CULTURE

Many requests from abroad for technical cooperation have been directed to the shrimp research laboratory established by Dr. Motosaku Fujinaga. He is the authority on the culture of "Kuruma" shrimp, a species cultivated commercially in parts of Japan. The requests have come from the U.S., France, Spain, Ireland, Italy, Malaysia, and the Philippines.

In March 1969, South Korea bought 1 million and France 11 million "Kuruma" fry artificially hatched in Japan and shipped by air. About 30% of the French shipment survived the flight.

S. Korean & French Projects

South Korea cultivates the juvenile shrimp in a 3-million-square-meter pond built on an island off her west coast.

France has started a 3-year experimental shrimp-culture project in the Mediterranean. She aims to establish a "Kuruma" farm in Abidjan, Ivory Coast, in 1972. The subsidized Government project is being undertaken by Ajiral (phonetic) Trans-Atlantic Company; Fujinaga's laboratory provides technical assistance. Three Japanese experts now are giving technical assistance. ('Minato Shimbun,' Oct. 9, 1969.)

* * *

U.S. CHINOOK SALMON FRY DOING WELL IN HOKKAIDO RIVERS

About 500,000 chinook (king) salmon fry (2-3 cm. long) were released in the Yoichi River, Hokkaido, in May 1969. The fry had been hatched from eggs sent by the University of Washington. In late June and July, local fishermen reported catching the smolt (12 cm.) in the Japan Sea near the mouth of the Ishikari River.

In the past, salmon fry have been released in the Tokachi river that flows into the Pacific, but this was the first release into a Hokkaido river flowing to the Japan Sea.

Hokkaido expects to release 4 million chinook fry in the Yoichi in a 5-year program to develop a fishing ground in Ishikari Bay. ('Minato Shimbun,' Aug. 7, 1969.)

* * *

TUNA PACKERS TROUBLED BY HIGH COSTS & LOW YIELD

Tuna packers in Shizuoka Prefecture (south of Tokyo) are troubled by the high cost of raw tuna and the low meat recovery. In October 1969, they were paying about US$315 a short ton for skipjack (usually packed in oil). However, the fish were so small--about 4.4 pounds--that pack yield was very poor. The packers were considering raising the prices for 7-oz. cans of tuna-in-oil, then quoted at $8.33 a case (48 cans per case) exwarehouse.

Switch to Bigeyed

Because of short domestic supplies, the packers were using increasingly bigeyed instead of skipjack. As a result, the prices for bigeyed were rising daily. Bigeyed imports from South Korea and Taiwan were quoted at US$454 a short ton for dressed-with-tail, and $403 for gill-and-gutted, 50% above the $277 paid earlier in the year.

JAPAN (Contd.):

Albacore Prices

In September, exvessel price in Japan for frozen albacore was $554-580 a short ton, about the same as the c. & f. price for direct exports to the U.S. In October, packers prices for small (8.8 pounds) fish were around $441.

Between the high costs and the poor yield, the Shizuoka packers were said to be losing money. They were canning just to keep going until the fall tangerine canning season began. ('Kanzume Tokuho,' Sept. 26, & 'Suisan Tsushin,' Oct. 9, 1969.)

* * *

RESTRICTIONS ON TUNA IMPORTS URGED

The Federation of Japan Tuna Fisheries has urged the Fisheries Agency to restrict tuna imports. The purpose is to help Japanese fishermen improve their international competitive status. The Federation contrasted the decline in Japan's tuna production during the past 2-3 years with the sharp gains made by South Korea and Taiwan. (The latter's output in recent years has increased 53% a year.)

The Federation explained that these countries, with no tuna markets of their own, definitely will increase their exports to Japan.

Federation's 12 Proposals

Twelve proposals to cope with import growth were presented to the Fisheries Agency. The Federation believes the Fisheries Agency should:

1) Prohibit foreign vessels from landing fish in Japan.

2) Reduce interest rates on long-term loans and raise loan ceilings.

3) Help establish a network of extra-low-temperature cold storages.

4) Improve fishery-law administration and revise some regulations.

5) Study model ship construction to increase economic value and efficiency of fishing vessels, and study vessel leasing.

6) Compensate fishing vessels seized and detained by countries with unilaterally declared extended sea limits.

7) Request South Korea and Taiwan to stop further fleet buildup. Encourage these nations to participate in the tuna scientific meeting proposed during Asian tuna conference.

8) Establish a home-owning system for vessel crewmen and reduce their income taxes.

9) Use imported labor.

10) Reduce wholesale fish market commissions and expand market facilities.

11) Set up council to regulate imports of competitive products.

12) Study feasibility of international management of tuna resource and adopt a country quota system.

7 Longliners Seized

The Federation noted that 7 Japanese tuna longliners have been seized off South America by countries claiming 200-mile limits--Ecuador, Peru, and Chile. Vessel owners have paid enormous fines ranging from US$10,000 to $33,000 per vessel.

The Federation is urging the government to revise seizure insurance to include payment of fines, and to establish a U.S.-type compensation law. It also proposed that economic assistance be extended to the seizing countries in return for assurance that they would not seize Japanese vessels. ('Suisan Tsushin,' Sept. 5, 1969.)

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TUNA CATCHES & EXPORTS DECLINED IN 1968

The 1968 tuna catch was 614,000 metric tons, down 38,000 tons from 1967's 652,000 tons. The distant-water longline catch was 339,000 tons, down 4% from 1967 (354,000 tons). Distant-water catch in the pole-and-line skipjack fishery was 136,000 tons, down 11% from 1967.

Tuna exports in 1968 were 107,078 metric tons, down more than 70,000 tons from 1967 (177,457 tons).

JAPAN (Contd.):

Catch, Average Exvessel Prices and Exports, 1967-1968[1/]

Species	Catch	Avg. Exvessel Price Fresh	Frozen	Quantity Exported
	Metric Tons	$/sh. ton	$/sh. ton	Metric Tons
Tuna:				
Bluefin	57,000	922	648	194
	(54,653)	(786)	(612)	(1,434)
Albacore	70,000	408	451	31,539
	(97,980)	(386)	(444)	(67,546)
Big-eyed	96,000	645	474	-
	(105,927)	(582)	(476)	-
Yellowfin	116,000	557	358	54,653
	(93,734)	(537)	(388)	(78,917)
Young tuna	14,000	-	-	6,260
	(15,030)	-	-	(16,255)
Skipjack	168,000	257	(fresh &	14,432
	(181,892)	(242)	frozen)	(13,305)
Sub-total	521,000			107,078
	(549,216)			(177,457)
Frigate mackerel:	23,000			6
	(29,310)			(149)
Billfish:				
Striped marlin	23,000	832	832	711
	(23,528)	(743)	(743)	(1,263)
Swordfish	19,000	592	592	7,035
	(18,703)	(474)	(474)	(7,194)
Other billfish	28,000	-	-	-
	(31,461)	-	-	-
Sub-total	70,000			7,746
	(73,692)			(8,457)
Total	614,000			114,836
	(652,218)			(186,212)

1/Figures in parentheses are for 1967.

Average exvessel 1968 prices for all species, except frozen yellowfin and frozen big-eyed, were higher than 1967's. ('Suisan Shuho,' Sept. 15, 1969.)

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TUNA IMPORTS ARE INCREASING

Japan imported 19,224 metric tons of frozen tuna during January-July 1969--26.2% over the 15,227 tons imported in same period 1968. Taiwan was the leading supplier, followed by Okinawa and South Korea. Their combined shipments were 16,200 tons, or 84% of Japan's total imports.

Becoming Tuna-Importing Nation

There are indications that 1969 imports will rise to 34,000-35,000 tons. Apparently Japan is fast becoming a tuna-importing nation. Imports have risen steadily over the past 6 years: 851 tons in 1963; 2,452 in 1964; 2,564 in 1965; 10,796 in 1966; 16,184 in 1967; and 28,964 in 1968. ('Nihon Suisan Shimbun,' Sept. 3.)

* * *

TUNA EXPORTS TO ITALY DECLINE

Japan exported 2,239 metric tons of tuna to Italy in September 1969, down from the average of 3,000 tons monthly during June, July, and August. Sales may decline further in October. According to Japan External Trade Organization representatives in Venice, 3,863 tons of yellowfin caught off west Africa by U.S. purse seiners, and transshipped from Abidjan, were delivered to Italy on September 4. ('Katsuo-maguro Tsushin,' Oct. 14, 1969.)

* * *

SEA URCHIN PASTE EXPORTED TO FRANCE

Daiwa Industries, Shimonoseki, has made the first Japanese shipment of sea urchin paste to France.

Daiwa is a leading processor of edible sea urchin paste. It received a French buy offer for 12,000 jars in mid-September 1969. On Sept. 20, it shipped 2,000 50-gram ($1\frac{3}{4}$ oz.) jars priced at about US$0.28 each. About 15,000 jars are to be sent by year's end.

New Product on European Market

About 6 months before, after learning the French eat raw sea urchin roe, Daiwa developed a paste for French tastes. Samples were favorably received. The firm, hoping to develop more markets, also sent samples to Spain, Italy, and West Germany. ('Minato Shimbun,' Sept. 28, 1969.)

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RAISE PRICE OF CANNED SALMON TO U.K.

Earlier this year (1969), the Canned Salmon and Crab Joint Sales Company announced the new offer price of canned red salmon to Britain. Later, the new offer price for canned coho salmon was set at US$22.80/case c.i.f., an increase of about 25% over 1968. The price of canned king salmon had not yet been decided early in August. ('Suisan Tsushin,' Aug. 12, 1969.)

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JAPAN (Contd.):

1968 TUNA SURVEY IN SOUTH ATLANTIC REPORTED

The Japanese Fisheries Agency has released the results of a tuna survey in the central and western areas of the South Atlantic. The Government-owned research vessel 'Shoyo Maru' (604 gross tons) departed Japan Sept. 1968 and returned March 1969.

Cruise objectives were to assess abundance and distribution of tuna, primarily southern bluefin, and to test labor-saving devices.

First Survey Area

The survey began around 30° S. lat. and 10° W. long. in the central South Atlantic and continued west. Surface temperatures ranged from 18.2° C. to 19.2° C. (64.5° F. to 66.5° F.); water transparency was 30 meters or more; no current boundary was observed.

In the first phase, 27 albacore, 2 yellowfin, and 1 bigeyed were taken on 13 longline sets (800 hooks) and four trolling (4 hooks). The albacore were 91-110 centimeters (35.8-43.3 inches) long; these were assumed to be adults, based on a comparison with the Pacific albacore, which mature at around 90 centimeters. The albacores' gonads weighed 30 to 180 grams. This indicated they were not fully developed.

Off Argentina's East Coast

Waters off the east coast of Argentina, within the 200-mile sea limit, were surveyed with the Argentine Government's permission. Three longline operations were conducted in an eastward direction to 51° W. long. around 45° S. lat. Catch composition varied widely, depending on area. Five albacore and 126 sharks were among the important species taken. No southern bluefin were caught. The correlation of southern bluefin distribution and oceanographic conditions, so evident in the Indian Ocean, was not observed in the southwestern Atlantic. ('Katsuo-maguro Tsushin,' Oct. 21, 1969.)

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SAURY (TUNA BAIT) SOUGHT IN NORTHEAST PACIFIC

Saury is the longline-tuna-fishermen's favorite bait. It used to be abundant off Japan, but the supply seems to be shrinking. Fishermen are looking for another supply.

Three Nichiro trawlers have been searching for saury in the northeast Pacific since July 1969. After a poor start, they finally located sizable concentrations off Oregon (U.S.) in September. Fishing began to improve around September 8. Reports from the fleet indicated an abundant resource. The trawlers are 'Akebono Maru', No. 21 and No. 17 (499 gross tons each), and No. 18 (492 gross tons).

Off Oregon

A Nihon Suisan trawler, 'Shinano Maru' (539 gross tons), also was scouting saury unsuccessfully off Japan. Encouraged by the Nichiro trawlers' reports, she proceeded to the Oregon coast about September 24. She made a good catch on her first day.

Fishing Methods

All 4 trawlers fish with 'boke ami' (stick-held dip nets) and make 8-10 sets a day. The medium size (10-12 inches) saury, similar to samples received from the U.S., are usable tuna bait.

Two Groups of Saury

The good fishing has raised Japanese hopes that this resource off the U.S. will support commercial operations. The survey has indicated 2 separate groups of eastern Pacific saury--Aleutian and Californian. The catches off Oregon were Californian. ('Minato Shimbun,' Sept. 28.)

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EXPLORES FOR BOTTOMFISH OFF ARGENTINA

The government-owned research vessel 'Kaiyo Maru' (2,539 gross tons) departed Tokyo Oct. 9, 1969, on a 163-day resource survey cruise to the southwest Atlantic. She is investigating bottomfish resources off

JAPAN (Contd.):

southern Argentina and the Falklands. Six government scientists and 3 industry specialists aboard will conduct fish utilization tests, processing the catches into 'kamaboko' (fish cake) and sausages.

Her Schedule

She was scheduled to call at San Diego, Calif., on October 24. In November and December 1969, she will call at Balboa, Santos in Brazil, and Buenos Aires and Mar del Plata, Argentina. She will return to Buenos Aires in January 1970, call at Cape Town in February, Singapore in March, and return to Tokyo on March 20, 1970. ('Suisancho Nippo,' Sept. 30, 1969.)

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JOINT SHRIMP VENTURES PLANNED IN WEST AFRICA

Three different fishing firms are planning joint shrimp ventures with west African countries. Nichiro Gyogyo and Kyokuyo Hogei will operate in Gambia, and Hokkaido Gyogyo Kosha in Senegal (50-60 French vessels reportedly are fishing shrimp out of Dakar).

The Japanese Fisheries Agency has advised the 3 firms to conduct experimental fishing with 1 or 2 vessels for about a year before entering into joint agreements. The Agency also advised them to consult each other before making contracts to avoid disrupting the market.

Kosha in Gabon

Hokkaido Gyogyo Kosha established a joint shrimp venture in Gabon in January 1969. The vessel 'Kohoku Maru No. 3' (250 gross tons) operated by the joint company reportedly is landing about 1,000 pounds of shrimp (550-660 pounds processed weight) every fishing day. ('Minato Shimbun,' Sept. 20.)

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JAPAN & MAURITIUS LAUNCH JOINT TUNA-PACKING VENTURE

The Japanese Overseas Fisheries Co. and the government of Mauritius will operate a tuna-canning plant at Port Louis. Mauritius requested it. Mauritius already permits the Japanese firm to use Port Louis as a tuna fishing base.

The venture, with an estimated capital of about US$83,000-111,000, will can about 250 tons of tuna-in-oil a month. ('Suisan Keizai Shimbun,' Aug. 26, 1969.)

日本

SOUTH KOREA

TRAWLING IN NORTH PACIFIC FAILS FINANCIALLY

W. P. Appleyard, Project Manager, FAO Advisory Services to Republic of Korea (ROK), reported to FAO Investment Conference, Rome, Sept. 18-24, 1969: "Only through trawling in international waters will Korea increase supplies for domestic markets and improve foreign exchange earnings since her coastal resources are fully exploited and increased fishing effort there would not add significantly to the total catch. Over the last 3 years various Korean companies have been operating in the North Pacific. All have fared disastrously. Poor equipment along with inexperienced management and crews have caused major problems and have almost forced 2 major firms into bankruptcy. Nor do the results obtained (in 1969) by a 9,000-ton factoryship appear more promising.

"Self-contained factory freezer trawlers have a better chance of success in the North Pacific. Recent results of a KMIDC (Korea Marine Industries Development Corporation) freezer trawler of 1,500 tons are encouraging, but it is hoped that the building of larger vessels (some of 4,000 tons are contemplated) will be the subject of detailed feasibility studies and not motivated by 'follow the leader' policy."

More Data in Seoul Paper

Additional data on ROK fishing in the North Pacific were disclosed in a Seoul newspaper. The ROK Office of Fisheries licensed the Korean fleet to fish north of 50° N. and east of 175° W. The total catch for 1969 was planned at 7,000 metric tons valued at 500 million Korean won (about US$1.8 million). The Office estimates that a large (1,500-gross-ton) stern trawler can catch fish worth about 200 million won (US$706,700) in 1 year of North Pacific operations. Operating costs are about 60% of

SOUTH KOREA (Contd.):

total earnings. Net profit could amount to as much as 80 million won ($282,700) per year per stern trawler.

Trawlers Need Support Vessels

According to the newspaper, the "most important thing ROK has learned from her fishing ventures in the N. Pacific is that comprehensive support measures are essential." Small trawlers must have a mothership to service them, and "independent" (nonfleet) stern trawlers must have a supply base. ('Hankuk Ilbo,' Sept. 4, 1969.)

MALAYSIA

FISHERY TRENDS IN SABAH & SARAWAK

There are about 6,500 full-time fishermen and 1,000 fish culturists in Sabah. Fish-processing plants employ about 1,000 workers.

Sabah's catches have grown from about 19,000 metric tons, worth about US$4 million, in 1962 to around 36,000 tons worth close to $9.7 million in 1968. The value of exported fishery products increased from about $833,000 in 1963 to $2.8 million in 1968.

Shrimp

The 3,200-ton shrimp catch in 1968 was worth about $3.3 million. Frozen shrimp exports to the U.S., U.K., Japan, and Europe amounted to 1,540 tons worth about $2.6 million.

Oysters & Cockles Surveyed

Sabah's Ministry of Agriculture and Fisheries is surveying the commercial development of oyster and cockle culture. The mangrove swamps and brackish lakes along Sabah's 900-mile coast reportedly have large oyster and cockle stocks. Oysters could become a major export item.

Sarawak's Landings

Sarawak landed about 13,900 tons in 1968, almost 23% shrimp. Landed value (money actually received by fishermen) was about $3.8 million; retail market value was about $6 million. The Fisheries Department is attempting to reduce costs at the dealer and middleman levels, and increase fishermen's earnings. (U.S. Consulate, Kuching, Aug. 15, 1969.)

TAIWAN

TUNA MARKETING FIRM REACTIVATED

The China Marine Trading Company (CMTC), a Taiwanese tuna-marketing firm, has been reactivated. Established in June 1968, it had been inactive for over a year. Organized with a capital of 30 million yuan (US$750,000), CMTC exports tuna for member firms that own tuna longliners of 200 or more gross tons.

In August 1969, CMTC sold 1,500-2,000 tons of tuna, transshipped from Capetown, to a large U.S. packer. Fish not wanted by the U.S. packer, such as bigeyed and spearfish, were sold on contract to a Japanese trading firm, Tokyo Shosha, for shipment to Japan. Shosha provides tuna bait for Taiwanese fishing vessels. CMTC plans to sell Taiwanese tuna catches landed at Tema (Ghana) to the same U.S. packer.

Taiwanese Prefer CMTC

Taiwanese longline owners favor CMTC tuna sales for two reasons: 1) the tuna catch is sold directly to buyers, and vessel owners get to know export prices; and 2) sales by their own nationals provide a sense of mutual trust.

CMTC's stepped-up sales effort has intensified rivalry with Japanese trading firms handling sales of Taiwanese tuna catches. ('Suisancho Nippo,' Oct. 30, 1969.)

PERSIAN GULF FISHERIES

David K. Sabock and James A. Gurr

Lands of fabled mystery and adventure, the countries bordering the Persian Gulf are rich not only in "black gold" (oil) but in fish and shellfish, especially shrimp.

Several Persian Gulf countries are developing fisheries as additional sources of income to oil--with some success. Such modern techniques and methods that exist generally are found in the shrimp trade. Saudi Arabia, Kuwait, and Bahrain have had the most successful fishery developments and, with Iran, ship large quantities of shrimp to the U.S. Iran has the longest coastline and a large share of the Gulf fishery resources within her territorial waters, but she has done little to exploit them. The Trucial States and Qatar also have resources that could be developed, but projected plans have not yet been fully realized. Iraq has a very short and unproductive coastline and has shown little interest in developing a marine fishery. As a whole, however, the Persian Gulf has virtually unlimited potential for expanded fishery production. A conservative estimate is that the total yield could be increased at least tenfold.

Private companies from the U.S., U.K., Italy, Greece, and Japan have participated in the area's shrimp fisheries. The USSR also fishes in the Gulf.

Fig. 1 - Fishing ports in the Persian Gulf.

Mr. Sabock is Foreign Affairs Officer
Mr. Gurr is Foreign Affairs Assistant } BCF Office of Foreign Fisheries, Washington, D.C. 20240.

CATCHES INCREASING

Total fishery landings in the region are estimated at 75,000-100,000 metric tons (live weight), perhaps up to one-third higher than the total catch in 1960 (table 1). Official statistics are not available on individual species; historical data are fragmentary. The catch is fairly evenly divided among Iran, Kuwait, Iraq, and Saudi Arabia, although it is not known what proportion of Saudi Arabia's catch is taken in the Gulf compared with the Red Sea and Arabian Sea. Relatively small amounts are landed in Qatar, Bahrain, and the Trucial States, a loose-knit group of 7 shiekdoms on southeastern coast of Persian Gulf.

Table 1 - Persian Gulf: Total Fish Landings, 1963-67

	1967	1966	1965	1964	1963
	. . . . . . (1,000 Metric Tons)				
Iran1/	22.4	21.0	NA	NA	NA
Saudi Arabia . .	21.6	19.9	18.6	20.2	19.6
Iraq2/	NA	18.3	12.5	19.2	11.3
Kuwait3/	13.0	11.0	11.0	10.0	9.0
Qatar3/	NA	NA	NA	0.6	0.6

1/Includes landings of foreign vessels licensed to fish in Iranian waters.
2/Data refer to wholesale markets only.
3/FAO estimates.
NA - Data not available
Source: FAO Yearbook of Fishery Statistics, vol. 24, 1967.

Although many species of fish and shellfish are caught, shrimp has attracted worldwide attention. Shrimp landings totaled 17,900 metric tons (live weight) in 1967--66% more than in 1964.1/ Saudi Arabia, Kuwait, and Iran, in that order, are the primary producers. Despite a large increase in world catch from 1964 to 1967, Persian Gulf countries have increased their share of world total from 1.8% to 2.6% (table 2). Industry estimates for 1968 indicate landings of about 20,000 tons, with 1969 results running at a comparable level. In 1965, catch per vessel peaked at 260 tons. Since then, the per-vessel catch has declined to less than 160 tons, while the number of vessels has increased.

MANY SPECIES AVAILABLE

Many species of demersal and pelagic fish abound in the fertile waters. Generally, the species are marine coastal types and include sea breams, snappers, pomfrets, mackerel, skipjack, spadefish, croakers, groupers, grunt, threadfin, gizzard shad, shad, yellowfin, shrimp, and many others. The shrimp is generally "pink," with a life cycle of 12-14 months.

Table 2 - Shrimp Landings (Live-Weight), 1964-67

	1967	1966	1965	1964
	. . . . . (1,000 Metric Tons)			
Iran.	4.1	4.6	-	-
Kuwait	6.0	4.0	4.0	3.8
Saudi Arabia	7.8	7.1	6.6	7.0
Total	17.9	15.7	10.6	10.8
World Catch	690.0	626.0	587.0	590.0
Percentage of World Catch . . .	2.6%	2.5%	1.8%	1.8%

Source: FAO Yearbook of Fishery Statistics, vol. 24, 1967.

PRIMARY FISHING AREA OFF IRAN

Fish and shrimp are found over a wide range, although more surveys are required to pinpoint additional commercially exploitable concentrations. The primary fishing area is off Iran. There, the Gulf's deepest part exists, and the flow of numerous streams into the Gulf results in much food.

The entire Gulf is rich in marine resources, but emphasis is on fishing in nearby, shallow coastal waters. This is only because sufficient vessels are not available to conduct distant fishing operations. Distant-water vessels are usually employed in shrimping.

Large concentrations of tuna, Spanish mackerel, sardines, and others, occur during September-March in the southern area from the Straits of Hormuz to Qatar. An influx of colder, less saline, more fertile water from the Gulf of Oman into the Persian Gulf carries with it large numbers of these fish. The primary fishery in this area occurs between Ras-Sha'am and Ras-al-Khaima. It is there that the deepest part of the Persian Gulf is close to the Trucial States. During the remainder of the year, fishing is conducted for shallow-water or bottomfishes for local markets.

Good catches are also made in the northern end, near Shatt al Arab, where the waters are enriched by the Tigris, Karun, and Euphrates rivers. The fishing grounds off Bushire and the island of Jazireh-Ye-Hormuz are among the best.

Shrimp are the principal off-shore species taken and are widely distributed. Main concentrations are in the northern, eastern, and southern sections and in the extreme northern part of the Gulf of Oman. The Iranian coast harbors the most valuable shrimp concentrations. Iranian shrimping centers are in the Shatt al Arab and Bandar 'Abbas regions.

1/The total shrimp catch probably is higher than that reported by official sources. Some catches are directly off-loaded and transshipped at sea and, therefore, are not recorded as landings.

Much of Saudi Arabia's and Kuwait's shrimp catch is taken near the coast of Iran. The Trucial States are not near the major shrimp fishing grounds. Fair quantities are harvested in Bahrain's coastal waters. The species Penaeus semisulcatus is found in the Gulf's northern part down to Qatar. Penaeus merguensis are centered on the Gulf's eastern shore, generally near Iran's Bandar 'Abbas region.

FISHING SEASONS VARY

Large-scale fishing is conducted throughout the Gulf from September through June. September-May is the main shrimp season. From September-March, mackerel, sardines, tuna, sailfish, kingfish, and marlin are readily available; a peak is reached in November-January. Pelagic fishing is at a low ebb during the hot summer. Fishing then is based on shallow-water and bottomfishes, such as rockcod, seabream, snapper, grunts, and horse mackerel.

FISHING VESSELS: CANOES TO MOTHERSHIPS

Standard fishing vessels are small rowboats, canoes, and sailboats. Although no exact data are available, it is reasonable to assume that these number in the thousands. Despite the heat, most vessels do not carry ice.

About 200 modern shrimp trawlers, with 6 large motherships, work the Gulf. Shrimp trawlers have been built or ordered from Norway, Pakistan, W. Germany, France, Mexico, USSR, and the U.S. Most are about 55'-62' length overall (l.o.a.) of many tonnages; the average likely is about 150 GRT. The motherships are as large as 4,000 GRT. About half the shrimp trawlers are based in Kuwait as a result of that country's early concern for developing a viable shrimp industry. Iran has not developed a large motorized fleet despite its long coast (800 miles) or nearness to the richest Gulf fishing area.

The same types of native vessels are common throughout the Gulf, although the names vary. Iranian names are used in this article. The smallest are the huris, dugout canoes 19 to 22 feet long with 1 to 3 fishermen. They are used to tend traps and to fish with hand lines. Next in size are the small sailing boolams (29-32 ft.) with removable coverings made of palm-leaf ribs. These carry 6 or 7 men and are used to set drift and seine nets for smaller fish. The shahrestan-e minab boats are larger (up to 49 ft.) and have removable decks of wooden boards. They carry 12 to 30 men and are used to fish for tuna and sardines with drift gill nets. Largest native boats are the chah bahar, broad-beamed, 32-96-foot sailboats. They carry 12-15 men and are used in gill-net

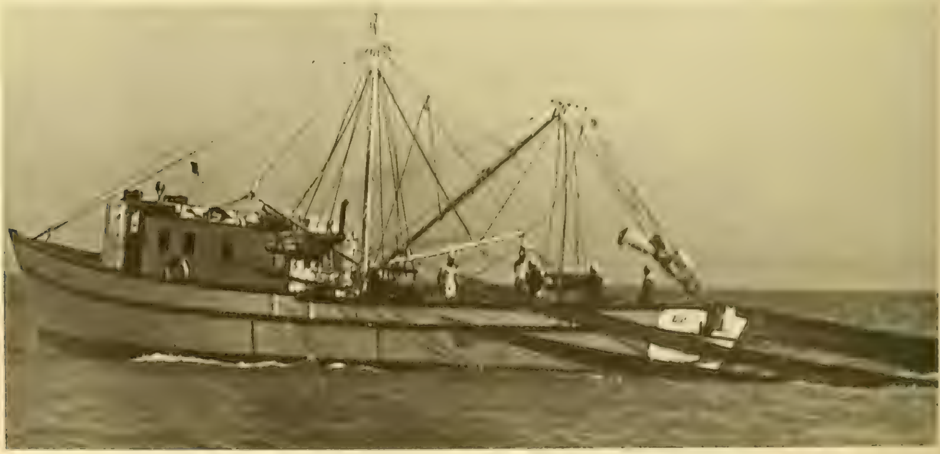


Fig. 2 - Saudi Arabian trawler.

fishing for tuna and kingfish. Except for the small huris, most boats are well constructed and seaworthy. The larger ones are suitable for mechanization.

MANY FISHING PORTS

Numerous fishing ports exist but none is well developed. Lack of fresh water and ice-making facilities and inadequate storage and distribution facilities are several principal deficiencies. In many instances, fish are landed at protected areas along beaches.

Primary Persian Gulf ports in Iran include Bushire, Abadan, Khorramshahr, Dayar, Bandar-e Lengheh, Kong, and Bandar 'Abbas.2/ Bandar 'Abbas, where Persian Gulf and Gulf of Oman meet, is probably the most modern Iranian port. Located near the important shrimp, tuna, and sardine fishing grounds, it is developing quickly. Some 50 vessels are berthed at this port. The only fish-processing plant in Iran is the Southern Fisheries Co. canning plant in Bandar 'Abbas. There is a highway link to interior cities.

Kong is Iran's only boatbuilding yard. Most vessels constructed there are about 30' l.o.a., with small engines, however, vessels up to 200 GRT have been built.

Abadan and Khorramshahr are on the Karun River, about 100 km. inland from the Gulf. Both have good harbors and rail and highway access to other areas. A large cold-storage facility (capacity 160-180 tons) is located in Khorramshahr. Shrimp vessels are provisioned from it by small coastal freighters.

Bushire (or Bushehre) is an important shrimp and finfish port; 90 vessels fish out of it. Large landings support the 3 local ice-making plants. Only about a dozen vessels operate from Dayar, a small port with few facilities. Bandar-e Lengheh has declined in importance and its facilities are inadequate. Over 200 vessels fish tuna and sardines from Jask, a major port on the Gulf of Oman.

Iran has a very short coastline and very few port facilities. Except for the river towns of Al Faw and Umm Qasr in the Shatt al Arab region, beaches are the only places for landing fish.

The city of Kuwait is the largest and most highly developed port on the Persian Gulf. It handles more fishing commerce than any coastal city in the other countries.

Damman and Manifa are the chief fishing bases along the coast of Saudi Arabia's Eastern Province. The shrimp processing and freezing installations there are expanding rapidly with commercial success. The poor handling facilities of the port of Damman has hindered the industry somewhat, but efforts are underway to improve the situation.

Encouraged by the Saudi shrimping success, the shiekdoms of Bahrain and Qatar are also developing commercial shrimping industries. Foreign capital has been invested in developing modern fleets and processing facilities on the island of Bahrain and on the Qatar peninsula.

Commercial facilities along the 300-mile Trucial coastline, from Qatar to the Straits of Hormuz, remain rather primitive. The vessels are similar to native craft used along the corresponding Iranian coast. Most fish are used locally, but some are dried for export to Ceylon and Singapore.

FISHING METHODS MOSTLY PRIMITIVE

Gulf fishermen use a wide variety of fishing gear. Modern trawlers, introduced only recently, were first used extensively by Kuwait. Saudi Arabia and Bahrain followed with imported mechanized vessels. However, the most prevalent methods are still primitive. Fish traps, shore seines, drift nets, gill nets, cast nets, and handlines are common. Dynamiting and poisoning are also used.

Shore seines, drift nets, and gill nets are used along the beaches for catching sardines and herringlike fishes. These nets are fairly large, frequently up to 320 meters long.

Cast nets and handlines are used by individual fishermen for many varieties of fish, but yields are smaller than the others.

Occasionally, fishermen use a "fish poison" of toxic lilac-tree seeds pounded up with dead crabs and small fish. This is spread over shallow water when the tide is bringing in fish. After eating this mixture, the fish come near the surface and go into spasms. The fishermen then go into the water and catch them by hand. Actually, this is not a destructive practice because the drug's effects do not last long.

2/Andersskog, Bjorn. 'Report to the Government of Iran on the Southern Co.', FAO, Rome, 1968.

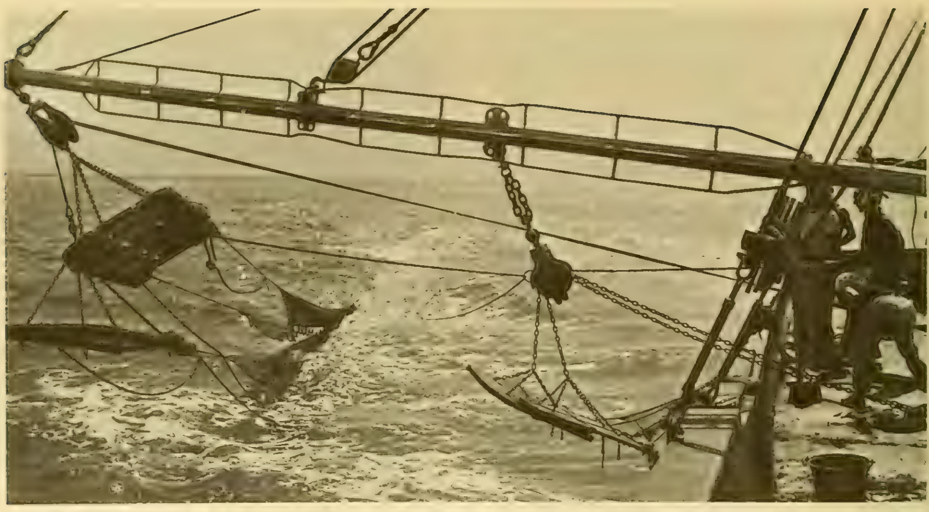


Fig. 3 - Hauling the nets.

Fig. 4 - Man at winch guides net onto deck.

Fig. 5 - Emptying the net.

Fig. 6 - Homeward bound fisherman mending nets.
(Photos: Ali Khalifa)

PROCESSING & MARKETING PROBLEMS

Processing and marketing techniques in Persian Gulf countries are modern only for the shrimp export industry. Fishery development plans all have as important objectives the modernization of processing facilities (i.e., ice production, cold-storage facilities) and better marketing methods. At present, however, marketing and processing are primitive, equipment old, and hygienic conditions suspect.

Fish is not an important item in the diet of Persian Gulf countries. Fresh fish and dried fish are popular forms for domestic consumption; fish is an important food only in coastal areas. Frozen fish are not an important market form. Some fish are smoked or salted for marketing.

Relatively little fish canning, if any, is done in any Persian Gulf Country except Iran. There, the plant at Bandar 'Abbas operated by the Southern Fisheries Co. cans tuna and sardines for domestic use and export to nearby countries. Its output has reached 33 tons a day. It has a 180-ton cold-storage area and plans to expand this. The plant closes from June through August because of extreme heat.

The most modern processing and distribution techniques and facilities are in the shrimp business, oriented primarily towards the U.S. Most of the processing--grading, cleaning, freezing, and packing--is done on board factory ships in the Kuwaiti and Iranian fisheries. Shrimp are not deveined until processed in the U.S. Sanitation methods and quality are reported to be equal to U.S. standards. In both countries, however, shore-based plants and cold-storage facilities are in operation. In Saudi Arabia, most processing is done at Manifa and Damman. However, there is a factoryship operation with packing, freezing, and storage.

FOREIGN TRADE SMALL

Foreign trade in fishery products, including imports and exports, is not significant. The notable exception is shrimp exports to the U.S. These have increased from 1.4 million lbs. in 1960 to 19.2 million lbs. in 1968 (table 3). Shrimp exports were 10% of total U.S. shrimp imports in 1968 and worth US$14.4 million. This area ranks only behind Mexico and India as leading supplier of shrimp to the U.S. Japan also is becoming an important market.

Kuwait is the area's main U.S. supplier. She increased shipments from only 146,000 pounds in 1960 to almost 9 million pounds in 1968. Saudi Arabian exports to the U.S. increased from 77,000 pounds to 3.7 million during the same period. Shrimp exports from Bahrain, which began with a modest 51,000 pounds in 1962, totaled 4.4 million pounds in 1968. Iranian shrimp exports have been erratic. These varied between 87,000 lbs. in 1963 and 9.1 million pounds in 1966--but fell to 2 million pounds in 1968.

Table 3 - U.S. Shrimp Imports from Persian Gulf Countries, 1960-64 Average, 1965-69

Country	1960-64		1965		1966		1967		1968		1969 (Jan.-Aug.)	
	Qty.	Value	Qty.	Value	Qty.	Value	Qty.	Value	Qty.	Value		
	1,000 Lbs.	US$ 1,000	1,000 Lbs.	US$ 1,000	1,000 Lbs.	US$ 1,000	1,000 Lbs.	US$ 1,000	1,000 Lbs.	US$ 1,000	1,000 Lbs.	US$ 1,000
Iran	934	496	6,800	4,400	9,106	7,371	1,674	1,212	2,016	1,680	1,603	1,597
Kuwait	1,968	1,330	5,818	3,829	5,744	4,203	8,053	6,229	8,960	6,653	1,660	7,748
Saudi Arabia	121	60	1,201	677	1,622	1,026	2,427	1,347	3,709	2,320	1,444	1,163
Bahrain	10	8	-	-	126	98	1,640	709	4,430	3,684	96	96
Arabian Peninsula	7	2	61	30	12	8	-	-	68	45	973	1,006
Total	3,040	1,896	13,880	8,936	16,610	12,706	13,794	9,497	19,183	14,382	5,776	5,610

SHALLOW & WARM PERSIAN GULF

The Persian Gulf is an area of about 70,000 square sea miles with a coastline of 1,740 sea miles. The coastlines of bordering countries are: Iran, 720 miles (260 of them on Gulf of Oman); Iran, 30 miles; Kuwait, 80; neutral territory, 40; Saudi Arabia, 240; and Trucial Oman, 630.

The Persian Gulf is a shallow, warm, saltwater body. Its average depth is about 35 meters. Near Shatt al Arab, at the northern end, the water is extremely shallow and there are extensive tidal flats. There also are mud flats east and west of Al Qatar, north and west of Qeshm Island, and at the northern end of the Straits of Hormuz. The Gulf's channel, ranging in depth from 40-50 fathoms, is along the Iranian coast. The bottom there, and in the delta of Shatt el Arab, is soft mud and clay. Along coastal regions, sand, coral, shell, and gravel interspersed with numerous coral reefs make up the bottom sediments. Coral reefs are especially numerous along the shallow southern coast.

WEATHER WINDS & HOT

Strong winds and hot temperatures characterize the weather. During winter, winds are generally light except for unexpected squalls. Squalls become more frequent in March and April when south and southwesterly winds come in. From gentle breezes early in the day, the winds freshen in the afternoon. It is hot in June and July, with winds variable from west and southwest. A swell caused by southerly monsoon coming from Gulf of Oman can result in turbulent seas that make fishing difficult even in calm weather. Later in the year, strong southeasterly winds arrive, and these support the monsoon swell. The weather calms after mid-August with light breezes in afternoon. From mid-September, weather clears, winds are light, and the southerly monsoon swell decreases.

In the summer, land temperatures are consistently over 100° F., water temperature varies from 90° F.-100° F. These conditions affect fishing in many ways. The techniques used to catch and store the fish, and the machinery aboard vessels, must be adequate to cope with extremely high temperatures.

Note: Information sources for this article include reports from U.S. Embassies and consulates, articles in trade journals, FAO reports, and other sources. A 49-entry bibliography is available on request from Office of Foreign Fisheries.

IS THERE ANY DANGER OF OVERFISHING?

In some areas of the world, overfishing is already a problem for some species. Stocks have been depleted in heavily fished areas such as the continental shelves of Europe, particularly the North Sea. Cessation of fishing during two World Wars proved that a decrease in fishing could result in an increase in the number of large specimens.

The U.S. Bureau of Commercial Fisheries has listed the following species as being seriously depleted: Pacific sardine, Atlantic salmon, Atlantic sturgeon, blue whale, fin whale, Atlantic shad, sperm whale, humpback whale, oyster, and sea otter. Depletion of these species is not caused entirely by overfishing; disease, predators, and water pollution all take their toll.

When the catch of a species reaches the point where the reproductive capacity is unable to compensate for the losses sustained, the species is headed for extinction. However, before this point is reached, operation of fisheries becomes uneconomical, and fishing of many species to extinction is thus prevented.

There is little agreement among fisheries experts on how much the world's fisheries could be increased. Estimates of the percentage of potential yield have varied from 1 percent to 75 percent. Undoubtedly the fish catch could be increased through exploitation of areas in the Southern Hemisphere and through fishing for species not now widely used for food. ("Questions About The Oceans," U.S. Naval Oceanographic Office.)

AFRICA

SOUTH AFRICA

FACTORYSHIP MOVES TO INTERNATIONAL WATERS

The factoryship 'Suiderkruis' is being geared to fish anywhere in the world, not just in South and South-West African waters. She may venture as far as the North Sea and the Newfoundland fishing grounds and compete with Soviet, Japanese, and Portuguese fleets. The ship, and her fleet of small trawlers, already have made a successful pioneer long-range fishing trip off the bulge of Africa.

Catcher Boats Too Small

The catcher boats used by Suiderkruis off North Africa were drawn from the South African fishing fleets. They are too small to be used off the African bulge, which is lashed by northeast trade winds. A company official said: "The spirit of the men was fantastic after their long trip. After sailing almost 5,000 miles in small 72-ft. boats . . . not suited for these stormy seas, there were hardly any incidents when the men came ashore."

To Buy New Catchers

The official added: "We are buying some of the most modern catchers in the world, which will enable us to fish anywhere from the Arctic to the Antarctic." The first 4 or 5 will be built in Norway. Possibly, others will be built in Spain, or elsewhere. They will be steel, about 320 tons--much bigger than the South African boats--centrally heated and air-conditioned.

Based at Las Palmas

Two of the new Norwegian catchers should be in Las Palmas now. Suiderkruis, with full support from the Spanish authorities, is being allowed to use Las Palmas as a permanent unloading port. The S. African company has made Las Palmas its northern base.

Good Distant-Water Catches

In the first 2 months after Suiderkruis sailed from South African waters, the fleet caught 14,300 long tons. These yielded 3,000 tons of fish meal. Fishing was mostly a probing operation. The vessel kept moving instead of fishing one area for some time. Fish were caught in deep water 50 miles south of the Congo for 2 or 3 days. Then the fleet moved round the bulge of Africa. At times, Suiderkruis found herself among 93 boats from 7 nations. She was scheduled to spend 2-3 months off North Africa before returning to South-West African waters. ('Sunday Times,' Cape Town, Oct. 26, 1969.)

* * *

FACTORYSHIPS DO WELL OFF NORTHWEST AFRICA

South Africa's two industrial fishery factoryships, 'Willem Barendsz' and 'Suiderkruis,' were sent to fish off Spanish Sahara during South and South-West Africa's closed fishing season. Both ships left South African waters early in September to cruise off Northwest Africa.

Suiderkruis' Success

The Suiderkruis found fishing promising and will remain in the area for several more months. She unloaded 3,000 short tons of bulk fish meal at Las Palmas in early October and returned to the fishing grounds.

The Barendsz

Owners of the Willem Barendsz said only that the closer the ship was to Las Palmas, the better the fishing. ('Cape Argus,' Oct. 11, 17, 1969.)

SOUTH & SOUTH-WEST AFRICA

CATCHES DROP

The 1969 fishing season presents a mixed picture. While higher meal and oil prices seem likely to push inshore industry earnings to about US$1.4 million ($1.2 million in 1968), there are signs that the Southeast Atlantic resource is being overfished. The factoryships fell short of their combined quota of 570,000 short tons of fish. They caught only 519,000 tons. They now have ventured into international waters.

SOUTH & SOUTH-WEST AFRICA (Contd.):

Spiny Lobster Canning Drops

When only two months remained in the season, the spiny lobster industry reportedly had canned only about half of 1968's total of 554,000 cases (20 lbs. a case). Finally, the local trawl fishery, facing heavy foreign competition, has indicated a further catch decline. This spurred calls for government assistance. (U.S. Consul, Cape Town, Oct. 28, 1969.)

TANZANIA

LAKE VICTORIA LANDINGS RISE

In 1967, Lake Victoria fishermen caught 43,752 short tons of fish. In 1968, the catch increased 35% to 59,853 tons worth US$5,635,492. The catch was composed of 23,742 tons ($2,415,593) from the Mwanza region; 25,215 ($1,817,860) from Mara region; and 10,896 ($1,402,039) from West Lake.

Species & Gear

The catches included 13 different species. Haplochromis led with 21,063 tons; Tilapia zillii trailed with 725. The catches were made by 11,517 fishermen in 2,538 canoes, using 80,573 gillnets, 616 seine nets, and 296,500 long lines. This was an increase over 1967 of 3,104 fishermen, 723 canoes, 7,536 gillnets, 462 seine nets, and 157,798 long lines.

Mechanization

Only 166 canoes had outboard engines in 1967; in 1968, there were 304--189 in West Lake, 93 in Mwanza, and 22 in Mara.

Fishermen's Income

Average income for fishermen in each of the 3 regions was $794 for a 5.53-ton catch in West Lake, $486 for 5.59 tons in Mara, and $402 for 4.44 in Mwanza. ('Mwanza Regional Fisheries Officer's Annual Report, 1968', U.S. Embassy, Dar es Salaam, Sept. 26.)

SOUTH PACIFIC

FIJI

TUNA LANDINGS RISE IN 1969

South Pacific tuna fishing has been generally good this year, although landings have declined since late August after season's peak had passed. From January through July, 4,700 metric tons of tuna were landed--80% of total 1968 landings (5,800 tons).

The Fleet

Twenty-nine vessels are based at Fiji--9 of Minami Taiheiyo Gyogyo (Japan), 18 of Korean Fisheries Development Corporation, and 2 Taiwanese vessels from separate companies. The catch is 80-85% albacore, and about 1% yellowfin. The high-priced albacore catch is greater than the others, so fishermen's profits have been good.

Prices

August prices, per metric ton: US$448 for frozen albacore, $432 for chilled albacore, $361 for frozen yellowfin, and $331 for chilled yellowfin. ('Suisancho Nippo,' Sept. 4, 1969.)

AUSTRALIA

TAIWANESE VESSEL SEIZED

The Taiwanese fishing vessel 'Fu Chih No. 1' was seized inside Australia's "territorial limit" on August 29, 1969. Australia claims a 12-mile fishing limit and a 3-mile territorial sea. Captain and crew were fined US$2,775. The vessel was permitted to leave after the Taiwan Embassy in Canberra guaranteed payment.

She sailed on September 3, but was apprehended again on Sept. 16 fishing inside the limit off North Queensland. This time the skipper was fined $1,100 but no charges were pressed against the crew. On Sept. 30, she departed for Taiwan. (U.S. Consulate, Brisbane, Sept. 4, 17; Oct. 1, 1969.)

SHRIMP FARMING ANYONE?

BCF is conducting research to put the harvesting of shrimp on the same basis as rice, dairy, and poultry farming. This research, called shrimp mariculture, is carried out at the Bureau's Biological Laboratory in Galveston, Texas.

Three species of Gulf shrimp--brown, pink and white--make up the bulk of all shrimp landed in the U.S. The shrimp fishery is the most valuable of all U.S. fisheries. In 1968, landings of 292 million pounds were worth about $113 million to fishermen. About 70% of this catch came from the Gulf of Mexico.

BCF biologists periodically sample shrimp grown in 1/16-acre ponds at Galveston, Texas, to obtain information on length and weight increases. These data will help determine the economic feasibility of shrimp farming in the U.S.

Consumer demand for shrimp, either as food or bait, is increasing at a rapid rate. But landings of shrimp from the Gulf of Mexico, with few exceptions, have remained relatively constant over the past 10 years. The increased demand for shrimp is reflected by increased imports. To supplement this important fishery, and to offset rising imports, BCF began studies in 1964 to determine the economic feasibility of shrimp farming. Although shrimp mariculture has been common abroad for many years, notably in Japan, it is still on an experimental basis in the U.S.

Studies underway may be divided into larval shrimp culture and juvenile shrimp culture. The young shrimp, immediately after it hatches, is called a larva and is free floating in the water. The older, juvenile shrimp, however, lives on the sea floor. The physiological requirements of larval and juvenile shrimp vary considerably; each phase of research has separate and distinct problems related to the age of the shrimp.

Culture of Larval Shrimp

Until a few years ago, Gulf shrimp had never been hatched and reared to the juvenile stage in the U.S. Bureau scientists have now developed techniques whereby thousands of penaeid shrimp can be reared from eggs deposited in the laboratory.

To obtain spawning stock, biologists aboard chartered shrimp vessels collect female shrimp that are ready to spawn. Each female carries between 500,000 and 1,000,000 eggs. In the laboratory, the shrimp usually spawn during the first or second night of captivity.

Initially, because of many problems, only a few shrimp could be reared from eggs spawned in the laboratory. The biggest problem was finding a suitable food that could be grown in large quantities. Larval shrimp are about 1/100 to 1/5 inch long and feed, in part, on tiny marine plants called phytoplankton. Today, after months of experimenting with different marine plants and various kinds of water, biologists in Galveston can grow large amounts of phytoplankton for shrimp food. As the larvae become older, brine shrimp, (artemia) also are used as food.

Additional refinements in larval culture have permitted Bureau biologists to supply small shrimp to nonprofit research organizations involved in other phases of shrimp mariculture.

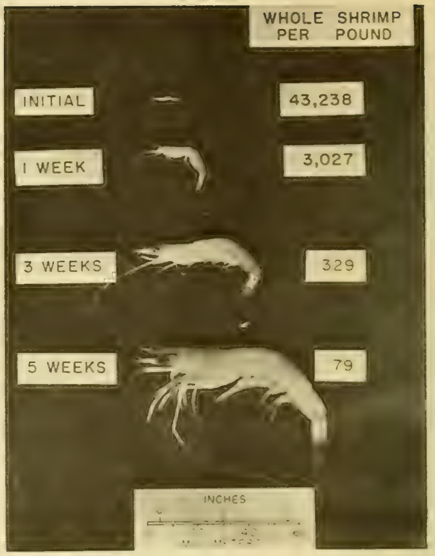
(Continued following page.)

Culture of Juvenile Shrimp

Shrimp reared to about $\frac{1}{2}$ inch in the laboratory have been stocked at varying densities in ponds. Two methods have been used to induce growth in shrimp. One was to feed shrimp daily a prepared diet of ground fish and shellfish mixed with commerically produced livestock food. Shrimp fed the prepared diet grew to about 4 inches in 3 months, or at a rate of about $\frac{1}{2}$ inch every 12 days. When harvested, the greatest yield was about 234 pounds of whole shrimp per acre.

The other method used to induce shrimp growth was to fertilize the ponds. This stimulated the growth of organisms that occurred naturally in brackish waters, and provided food for the shrimp. Shrimp 1 inch long grew to about 4 inches in 5 to 6 weeks, or at a rate of about $\frac{1}{2}$ inch every week. The greatest yield was 575 pounds of whole shrimp per acre.

BCF Biologists found, however, that growth stops when the shrimp are about 4 inches long. It is not known whether this retarded growth is the result of some physiological requirement not met in the ponds, or to a change in diet.



Growth of white shrimp (Penaeus setiferus) over a 6-week period in an artificial environment. These shrimp were "farmed" in a fertilized, brackish water pond at the BCF Biological Laboratory, Galveston, Texas. BCF scientists are developing an economical prepared food that will sustain rapid growth of shrimp in ponds.

Although the results of experimental shrimp farming are promising, future Bureau studies will be made to: (1) develop an economical prepared food that will sustain rapid growth of shrimp in ponds; (2) develop methods to induce shrimp maturity and spawning and to control time of spawning; (3) develop fast-growing shrimp that have favorable tail-weight to head-weight ratio and are disease resistant and hardier than wild shrimp; (4) determine which diseases and parasites occur in shrimp and develop means to control them. (National Marketing Services Office, Bureau of Commercial Fisheries, United States Department of the Interior, 100 E. Ohio Street, Room 526, Chicago, Illinois 60611.)

FOOD FISH FACTS

BLACKBACK or WINTER FLOUNDER
(Pseudopleuronectes americanus)

FLUKE or SUMMER FLOUNDER
(Paralichthys dentatus)

Flounders, an important year-round food fish, are members of a large family of flatfish which includes winter flounder, summer flounder (sometimes called fluke), starry flounder, yellowtail flounder, and a wide variety of soles and dabs. Flounder, highly prized by sport as well as commercial fishermen, weigh from $\frac{1}{2}$ to 5 pounds. The summer flounder, however, weighs up to 15 pounds.

DESCRIPTION

Flatfish could well be called the clowns of the sea. Although they come in a variety of sizes, all of them are bizarre in appearance. Born upright with normally placed eyes, young flatfishes soon find their skulls beginning to twist and one eye moving toward the other side. At the same time the fish begins to tilt. Within a short time both eyes peer from the same side and the fish swims with the eyeless side down. Not all flatfish twist in the same direction, some twist toward the right and some toward the left. As an example, the blackback is a righteye flounder and the fluke is a lefteye flounder. As the head and eyes twist, the mouth becomes distorted and the flatfish "ever after wears a crooked, pained look." (National Geographic)

Flounder resemble flying saucers as they ripple and glide through the water. Part of nature's camouflage is the way they glide to the bottom and then flip sand over their backs, becoming almost invisible except for their protruding eyes. When a small fish or other prey is spotted, the flounder, with a squirt of water from the under-side gill, jet-propels itself off the bottom in hot pursuit. The white, belly side blends with the light filtering down through the water, protecting it from enemies below. The darker top side usually resembles the color of the bottom on which the flounder lives.

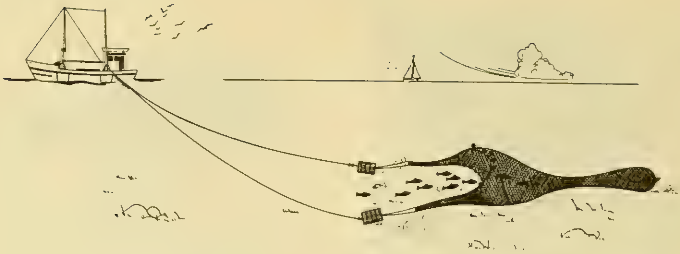
HABITAT

Flounder are found along almost every coastline of the United States. Among those found on the Pacific coast are the rex, petrale, English, Dover, sand, and rock soles, and the starry flounder. The Atlantic and Gulf coasts provide winter, summer, and yellowtail flounders, and a variety of soles. Most flounder live along the Continental shelf and slope, however, some come into shoal waters and are found in bays and close inshore along the coast.

FLOUNDER FISHING

More flounder are caught commercially with otter trawls than any other method. Sport fishermen use a variety of methods including angling and the use of a rod-type spear called a gig. The gig is used with a light to show the fish on the bottom and this method is used mostly in the Gulf and South Atlantic states.

(Continued following page.)



The otter trawl is dragged over the ocean floor to catch flounder.

CONSERVATION

In order to provide a variety of fish and shellfish for a growing population and a continuing resource for the fishing industry, cooperative State-Federal research and development efforts are needed. In recognition of these needs, Congress passed two major pieces of grant-in-aid legislation, the Commercial Fisheries Research and Development Act of 1964 and the Anadromous Fish Act of 1965. Through these Acts, the Secretary of the Interior, with BCF acting as administrator, has entered into cost-sharing cooperative agreements with the States and other non-Federal interests. In addition to the benefits already derived from the above Acts, BCF has developed a number of improvements which are proving beneficial to the fishing industry as a whole. Among these are trawl fishery improvement programs, such as a universal trawl capable of fishing at midwater depths as well as on the bottom, and an independently powered sonic instrumentation system to provide shipboard recordings of the fishing performance of otter trawls.

USES OF FLOUNDER

Flounder is considered one of the finest of all food fish. It has firm, white, delicate flesh that adapts to a wide variety of preparation methods. Most flounder and sole are filleted and can be purchased either fresh or frozen. Fillets vary in weight from 2 to 4 ounces and up to 8 ounces. Some flounder and sole are dressed and sold whole for stuffing. (National Marketing Services Office, BCF, U.S. Dept. of the Interior, 100 East Ohio, Room 526, Chicago, Ill. 60611.)

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INDEX (CONTINUED)

THIS CHRISTMAS TREE IS SHRIMPLY DELICIOUS

In answer to many requests, the United States Department of the Interior's Bureau of Commercial Fisheries has once again released instructions for its Shrimp Christmas Tree for the most exciting holiday table in the neighborhood.

From a commanding position on a buffet table or as a colorful centerpiece for a well-appointed holiday dinner, this unusual tree is certain to capture compliments. Leafy green endive duplicates crisp holly while ever-popular shrimp add shape and color interest to this creative conversation piece.

This intriguing tree is elegant but deceivingly simple. The materials are readily available at most local variety stores and supermarkets.

SHRIMP CHRISTMAS TREE

3 pounds shrimp, fresh or frozen
2 quarts water
$\frac{1}{2}$ cup salt
4 large bunches curly endive

1 styrofoam cone, $2\frac{1}{2}$ feet high
1 styrofoam square, 12 x 12 x 1 inch
1 small box round toothpicks
Cocktail Sauce

Thaw frozen shrimp. Place shrimp in boiling salted water. Cover and simmer about 5 minutes or until shrimp are pink and tender. Drain. Peel shrimp, leaving the last section of the shell on. Remove sand veins and wash. Chill. Separate and wash endive. Chill.

Place cone in the center of the styrofoam square and draw a circle around the base of the cone. Cut out circle and insert cone. Cover base and cone with overlapping leaves of endive. Fasten endive to styrofoam with toothpick halves. Start at the outside edge of the base and work up. Cover fully with greens to resemble Christmas tree. Attach shrimp to tree with toothpicks. Provide Cocktail Sauce for dunking. Serves 12.

U. S. GOVERNMENT PRINTING OFFICE : 1969 332-624/5

UNITED STATES DEPARTMENT OF THE INTERIOR

Walter J. Hickel, *Secretary*

Russell E. Train, *Under Secretary*

Leslie L. Glasgow, *Assistant Secretary*
for Fish and Wildlife, Parks, and Marine Resources

Charles H. Meacham, *Commissioner*, U.S. FISH AND WILDLIFE SERVICE

As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States -- now and in the future.

Holiday Greetings

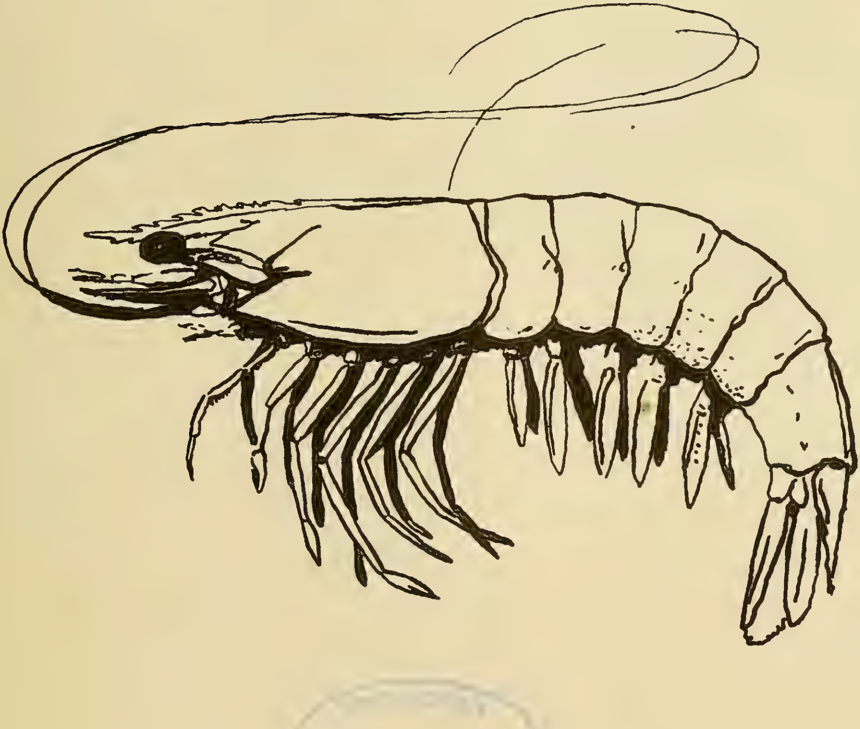
From The

Bureau of Commercial Fisheries

A4463X
Fishes

COMMERCIAL FISHERIES Review

Index for 1969 - Volume 31



COVER: In 1969, U.S. shrimp fishermen received about $125 million for their catch. For first time, shrimp catch in Gulf of Mexico brought more than $100 million to fishermen.

COMMERCIAL FISHERIES
Review

A comprehensive view of United States and foreign fishing industries--including catch, processing, marketing, research, and legislation--prepared by the Bureau of Commercial Fisheries.

FISHERMEN'S MEMORIAL--GLOUCESTER, MASS.

Production: Jean Zalevsky
Alma Greene

An index of Volume 31, Numbers 1 through 12, issued in 1969. It is a subject index, with an author index for only the feature articles in each monthly issue. Indexing of other material is based on the principal subject with some cross-reference. The use of "_____" in entries denotes the omission (repetition) of the major subject heading which appears in ALL CAPS.

Publications listed in the "Books" section have not been indexed.

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Use of funds for printing this publication was approved by the Director, Bureau of the Budget, April 18, 1968.

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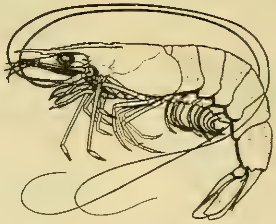
A limited number of back issues of Volume 31, Numbers 1 through 12, are still available until the supply is exhausted. Copies are available free upon request from Commercial Fisheries Review, U.S. Bureau of Commercial Fisheris, 1801 N. Moore St., Rm. 200, Arlington, Virginia 22209.

INDEX TO VOLUME 31 (NUMBERS 1 - 12 INCLUSIVE)--1969

The reference gives the month and the page number.

Issued January 1970.

FOOD FISH FACTS



SHRIMP

Shrimp have long been considered the most popular shellfish in the United States. This is not surprising because shrimp have a distinctive flavor, and the pink-white, cooked meat is tender, delicate, and delicious. Shrimp may be prepared in hundreds of versatile ways. There are three main varieties of shrimp harvested in the United States: the Northern shrimp, found in the offshore waters of Maine and Massachusetts; the tiny, North Pacific shrimp, found along the coastlines of California, Oregon, Washington, and Alaska; and Southern shrimp, taken from waters of the Gulf and South Atlantic states.

DESCRIPTION

The shrimp is a ten-legged crustacean that acquired its name because of its relatively small size. The word shrimp was derived from the middle English word "shrimpe" meaning puny person and the Swedish "skrympa" meaning to shrink. Like other crustaceans, the shrimp wears its skeleton on the outside of the body and, in order to grow, casts off its shell and replaces it with a new one. Shrimp swim forward usually but when frightened the shrimp, with a flip of the abdomen, can propel itself backward with great speed.

There are three species of Southern shrimp which are commercially important and all three are members of one family Penaeidae. They are the common or white shrimp, the brown shrimp, and the pink or brown-spotted shrimp. The tiny, North Pacific shrimp and the Northern shrimp are the same species Pandalus borealis. Another species, Pandalus jordani, also called North Pacific shrimp, is landed in Washington, Oregon, and California. Of these three varieties, Southern shrimp are usually the largest and the North Pacific shrimp are the smallest.

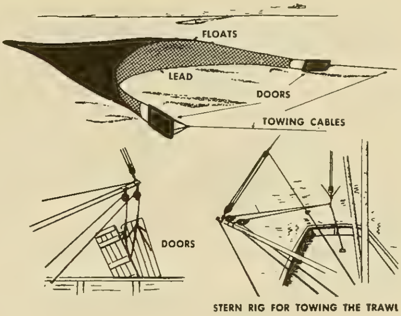
SHRIMP FISHING

Most shrimp are caught with otter trawlers of "draggers" which drag or tow a large, flattened cone of nylon netting called an otter trawl. As the net moves along the bottom the shrimp are swept into the mouth of the net.

MANAGEMENT AND CONSERVATION

The Bureau of Commercial Fisheries research vessels have made extensive systematic surveys and, in the process, have discovered new shrimp fishing grounds. Because of a decline in the number of shrimp available in some areas, the research vessels also study population shifts, the effects of seasonal changes, longevity of shrimp, food availability, and other pertinent data concerning conservation. Studies are also being made on the possibilities of shrimp farming.

(Continued following page.)



MANAGEMENT AND CONSERVATION (Contd.)

One of the initial shrimp farming experiments already underway by industry is on a five-acre site at St. Andrews Bay, Florida. Under controlled conditions, technicians are breeding, hatching eggs, and growing shrimp to commercial size. Before farming begins each area must be cleared of predatory fish which would eat the young shrimp. After clearing, the farming area is closed off by nets. Temperature and salinity of the water is carefully controlled and special diets are being studied for the newly-hatched shrimp. Early results indicate that shrimp farming may result in a much greater abundance of shrimp than is now possible through survival in natural surroundings. Another important possibility with shrimp farming is the replenishment of the natural shrimp supply.

USES OF SHRIMP

Shrimp are an excellent source of high-quality protein, vitamins, and minerals. They are low in fat and calorie content and are easily digested. The edible part of the shrimp is the tail section. Raw shrimp are often referred to as "green shrimp" at the retail level. Although raw shrimp vary in color, the cooked product is pink-white and the flavor and nutritional values are the same. Shrimp are usually sold according to size and are often referred to as jumbo, large, medium, and small. Shrimp are available in most areas of the United States either raw or cooked, peeled or unpeeled, and fresh or frozen. Peeled meats of shrimp, individually quick frozen, may be bought in poly-bags or rigid plastic containers in a variety of sizes and weights. Shrimp may also be bought by the pound or in convenient, shelf-ready cans. Regardless of size and variety, all shrimp may be used interchangeably in most recipes. (Source: National Marketing Services Office, BCF, U.S. Dept. of the Interior, 100 East Ohio, Room 526, Chicago, Ill. 60611.)

(Recipe page 42.)

SUPPER IS SIMPLY SUPER WITH SHRIMP

With the busy homemaker and career girl in mind, the Bureau developed Super-Shrimp Supper, a recipe that will add a touch of elegance to any buffet or supper party. This easy-do gourmet recipe may be prepared a day ahead and refrigerated. Shrimp, one of the most popular shellfish, have a distinctive, delicate flavor that adapts readily to many preparation methods. In Super-Shrimp Supper, the shrimp top fluffy rice and sliced mushrooms. A flavorful sour cream sauce blends the ingredients together and the end result is a culinary triumph that will become one of your favorites whenever you want to serve something extra special.

Shrimp are an excellent source of nutrition and contain high-quality protein, vitamins, and minerals. In addition, shrimp have a low-calorie content. Shrimp are sold according to size: Jumbo, large, medium, small, and tiny. Most seafood markets have shrimp in the following forms: raw or cooked, peeled or unpeeled, and fresh or frozen. Peeled meats of shrimp, individually quick frozen, may be bought in poly-bags or rigid containers in a variety of sizes and weights. Shrimp are also available in various sizes in convenient, shelf-ready cans.

SUPER-SHRIMP SUPPER

$1\frac{1}{2}$ pounds cooked, peeled, cleaned shrimp, fresh or frozen	2 tablespoons lemon juice
2 cups thinly sliced celery	2 teaspoons Worcestershire sauce
1 cup thinly sliced green pepper	$\frac{1}{2}$ teaspoon salt
1 cup thinly sliced onion	Dash pepper
$\frac{1}{4}$ cup butter or margarine	1 quart cooked rice
$\frac{1}{4}$ cup coarsely chopped pimiento	2 cans (4 ounces) sliced mushrooms, drained
1 pint sour cream	$\frac{1}{2}$ cup dry bread crumbs
1 cup light cream	2 tablespoons melted butter or margarine

Thaw frozen shrimp. Cook celery, green pepper, and onion in butter until partially cooked. Combine vegetables, shrimp, and pimiento. Mix sour cream, light cream, lemon juice, and seasonings. Combine $\frac{3}{4}$ cup cream mixture, rice, and mushrooms. Spread rice mixture evenly in a well-greased baking dish, 15 by 9 by 2 inches. Place shrimp mixture on top of rice. Pour remaining cream mixture over shrimp. Combine crumbs with remaining butter. Sprinkle over casserole. Bake in a moderate oven, 350° F., for 30 to 35 minutes. Makes 12 servings. This casserole may be prepared a day ahead and refrigerated. Allow about 30 minutes additional baking time.

For your copy of recipes on shrimp, oysters, or scallops send 45¢ to the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 and ask for Nautical Notions for Nibbling, Fishery Market Development Series No. 10. (Source: National Marketing Services Office, BCF, U.S. Department of the Interior, 100 East Ohio Street, Rm. 526, Chicago, Illinois 60611.)

☆ U. S. GOVERNMENT PRINTING OFFICE : 1970 392-626/7

UNITED STATES DEPARTMENT OF THE INTERIOR
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Philip M. Roedel, Director, BUREAU OF COMMERCIAL FISHERIES

MAN in danger

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